POPULAR SCIENCE

NOVEMBER · 35c *Monthly*

Your first look at the

1958 Chevrolet

plus: Color Photos of 14 New Cars

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featuring the easiest-to-use soldering tool ever designed . . . the Weller Soldering Gun

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Weller 250 Watt Soldering Gun alone . . . $12.95 (Model 8250A)

ONLY $14.95
Model 8250AK

WELLER ELECTRIC CORPORATION, EASTON, PA.

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ATTACK!

HEADED BY THE NEW M-20 ARMORED CAR

Bring more front-line realism to your U.S. Army Combat Team built from Revell Authentic Kits

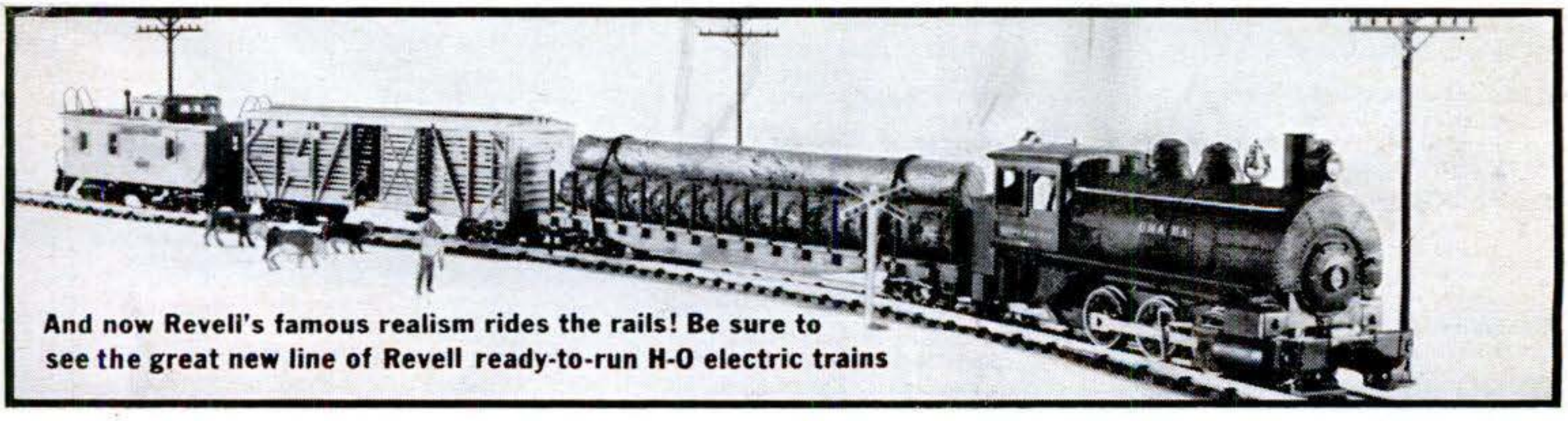
Send this rugged little reconnaissance vehicle into the thick of battle! Roll it along on its six movable wheels, swing the ring-mounted anti-aircraft machine gun around to cover all directions! Revell's scale model duplicates every authentic detail of the M-20, carries hand tools and a supply of land mines on side racks. There's an action crew of four, plus a rifleman and mine-detector man, included in the 65-piece kit. Start building yours today! 89¢

Have you put together all of Revell's U.S. Army combat models pictured above?

Long Tom gun with tractor $1.98
M-4 Sherman Tank $1.49
Radio Jeep and Communications Trailer 79c
G.I. Battle Action Figure Set 98c

Revell
Authentic Kits

wherever hobby kits are sold



And now Revell's famous realism rides the rails! Be sure to see the great new line of Revell ready-to-run H-O electric trains

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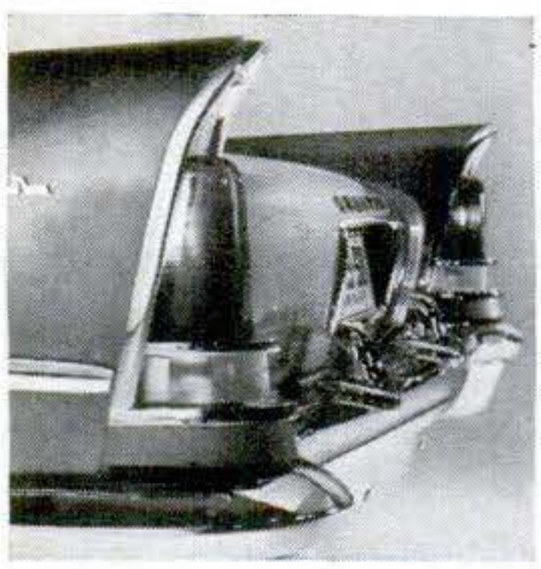
Founded in 1872 Vol. 171: No. 5 *Mechanics and Handicraft* REG. U. S. PAT. OFF.

Popular Science Monthly

November, 1957



A glittering roundup of the new cars—four-eyed, longer and lower—that some 6,000,000 Americans will drive off the showroom floor in '58

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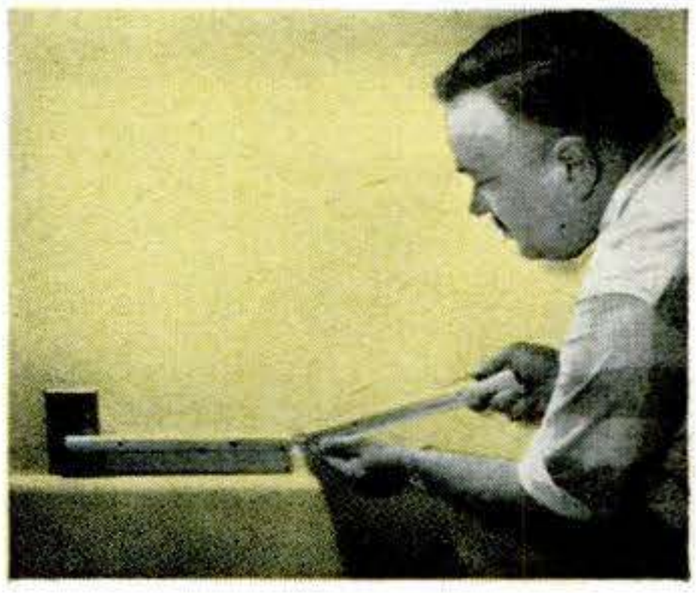

New electric outlets made easy! These strips screw to the wall to put 'em where you want 'em

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PS Readers

TALK BACK

PS Gives Him Big Ideas

SAY, that home-expansion section ["New Living Space for Your Home," Sept.] was a honey. I've already figured out how I can put the bedrooms in the cellar, convert the garage into the big living room we've always wanted, and

make the porch over into a kitchen-dining room. This will leave our present living quarters empty so that I can rent them out and retire.

Seriously, this is one issue I'll save. It contains some of the most practical home-expansion information I have seen. With the kids growing and demanding rooms (if not suites) of their own, expand is what we have to do.

J. S. SPENCER, San Pedro, Calif.

Booklet Answers His Questions

THE booklet on concrete blocks [Aug.] was very enlightening. For some time I have considered the idea of building a home of block. The ones I have seen were sturdy, neat looking and relatively inexpensive. Your booklet answered the questions I had in mind.

STEVE MOROSO, Pittsburgh

Gauges Save the Engine

AFTER reading "I Like the Gauges Detroit Left Out," [Nov. '55] I installed a set in my 1955 Ford that paid off.

While driving in Connecticut, I noticed a slight drop in oil pressure but drove on. It continued to drop to 10-to-15 psi at 50 m.p.h. I stopped—no oil. The red light did flash once when I stopped, but not while I was driving. I replaced the oil and drove on home thankful that I saved a good engine (25,000 miles on it then). A short time later my ammeter showed only a low charge, tipping me off to get my generator regulator adjusted. An investment of $10 has saved me many times that money—thanks to PS.

ALBERT F. KLARE, Everett, Mass.

More Uses for Tape Recorders

"WHY Buy a Tape Recorder?" [Sept.] makes me think that a tape recorder would be useful to DXers (hobbyists who like to listen to faraway places) and to other short-wave radio fans for making reception reports of broadcasts from different short-wave stations.

In this way the sending stations could hear their broadcasts over again just as they came over the short-wave radio in the countries to which they were beamed. This would be more accurate than a written report, and they could get more information out of a taped report.

A. KEITH FRITZSCHE, Hamilton, Ohio

. . . I was a little disappointed that author Henry Comstock did not mention corresponding by tape through the various clubs of tape-recorder owners. I happen to be a district deputy for the Voicespondence club, which has headquarters at Noel, Va. The club has 12 districts and a membership of about 840.

L. ROBERT CROUSE, Perryville, Md.

Music Box to Alarm Speeder

THOSE speed alarms you have in the August issue are very interesting, but they have nothing on my Uncle's invention. Way back before the war my Uncle had one of those cars that showed a red light if you went over 50 m.p.h. But he wasn't satisfied. (I think it was because he never drove below 50 and didn't think it was doing him any good.)

Anyhow, he wired up an electric music box to the speedometer. Every time you

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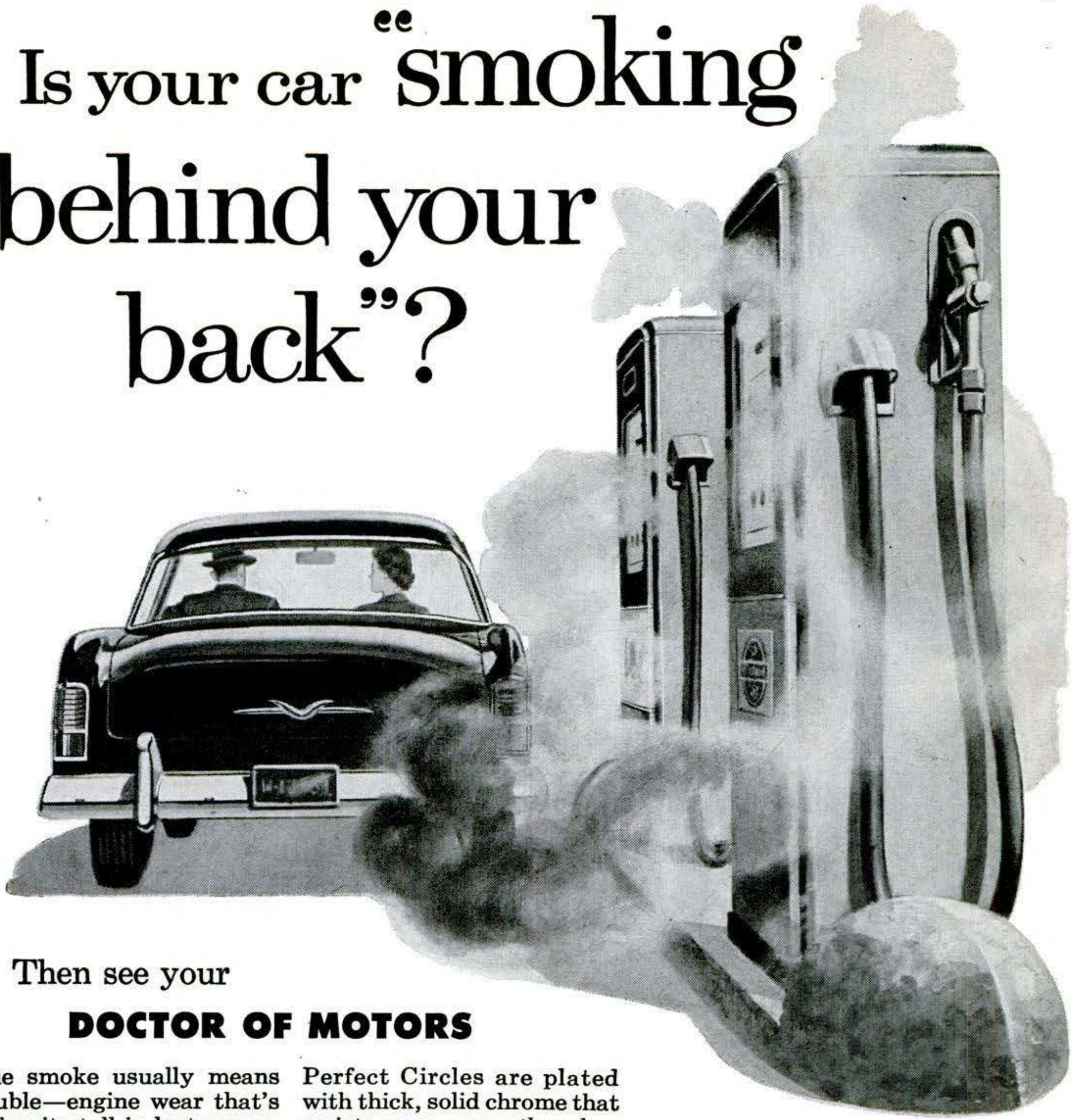
Is your car "smoking behind your back"?



Then see your

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Blue smoke usually means trouble—engine wear that's taking its toll in lost power, performance—wasted oil, fuel and money! What to do? See your Doctor of Motors —your skilled mechanic— the man who knows how to restore engine efficiency and that "New Car Feel."

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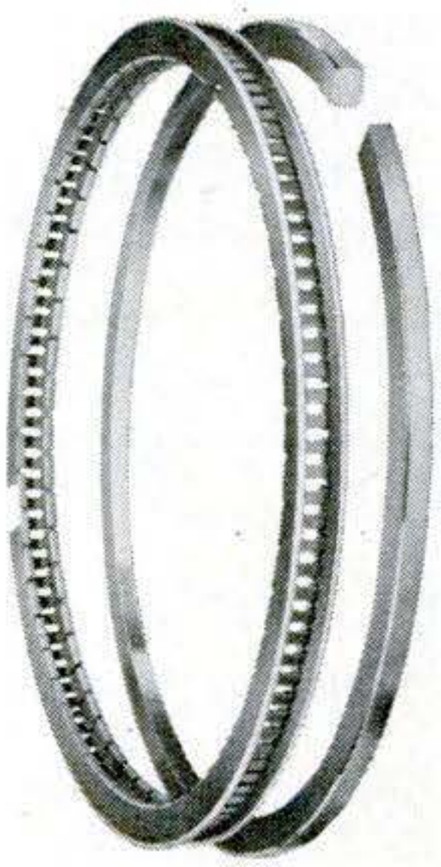

You'll be surprised how quickly and economically your dependable Doctor of Motors can bring back a "New Car Feel" to your car. See him now!

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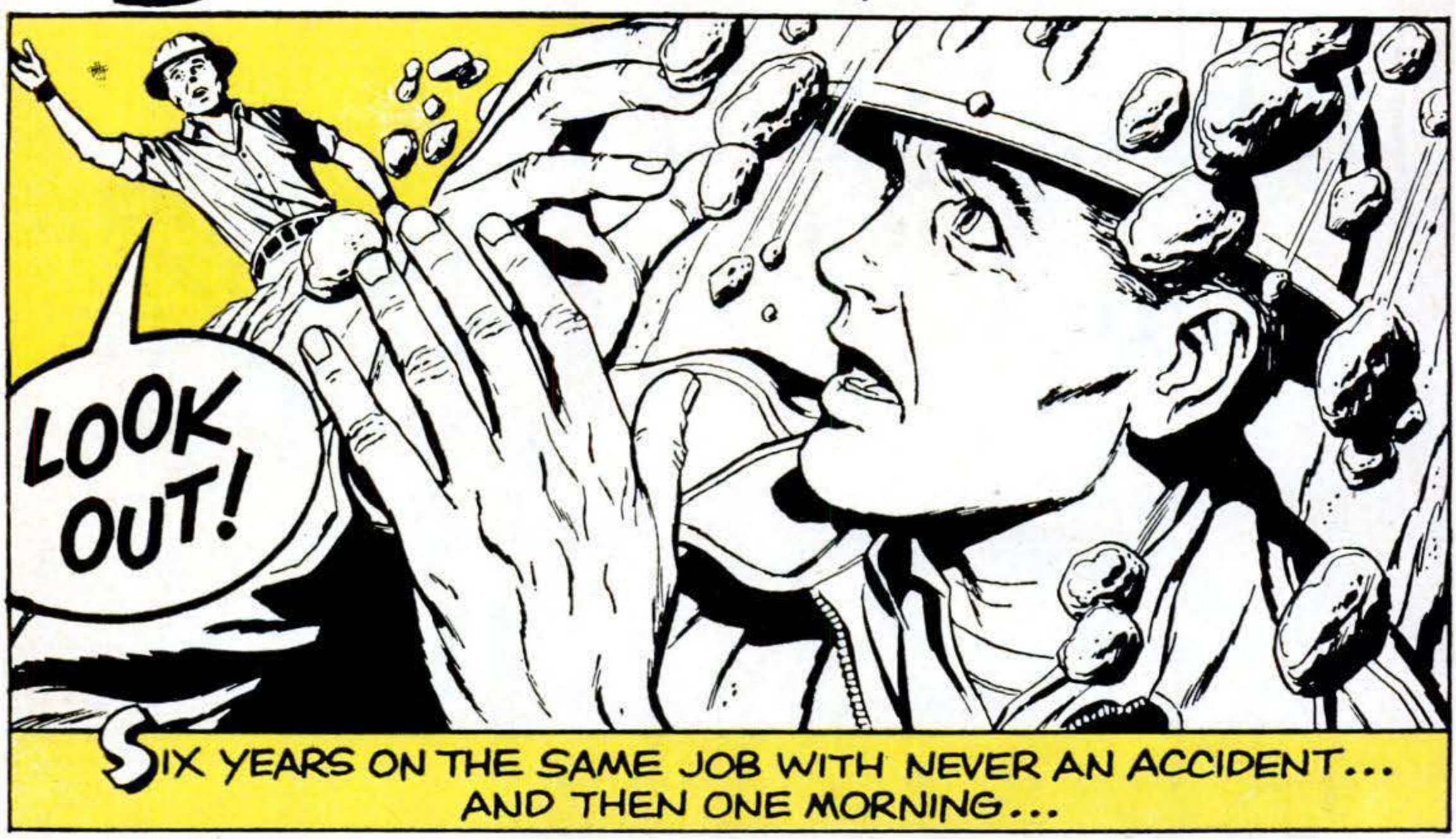

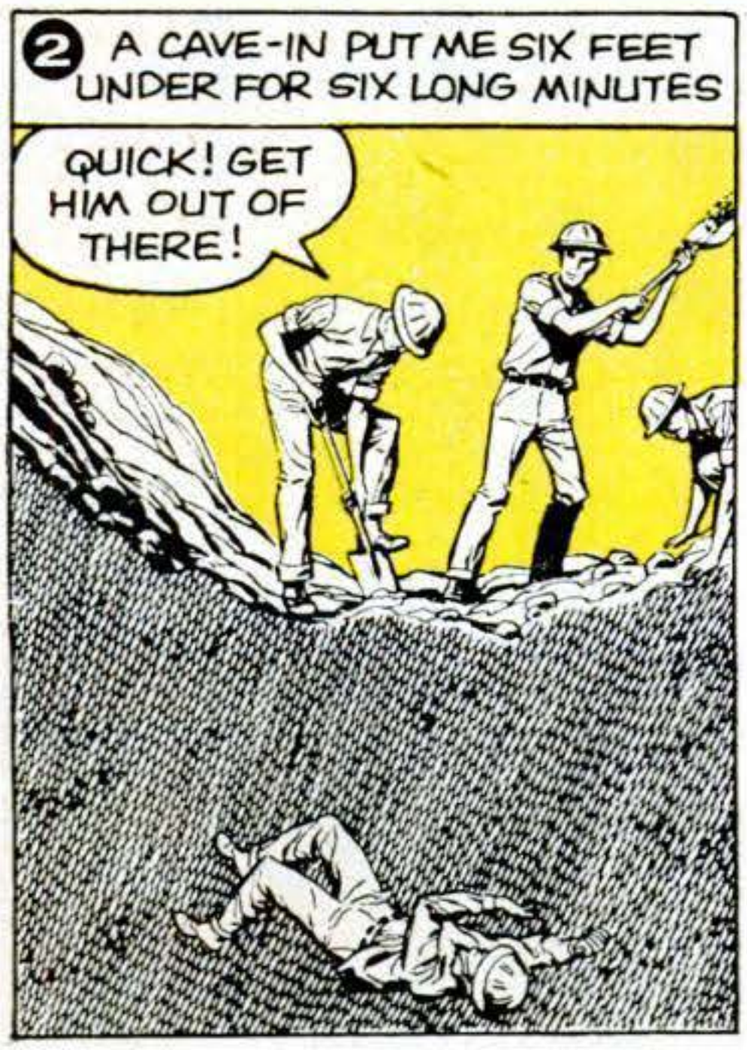

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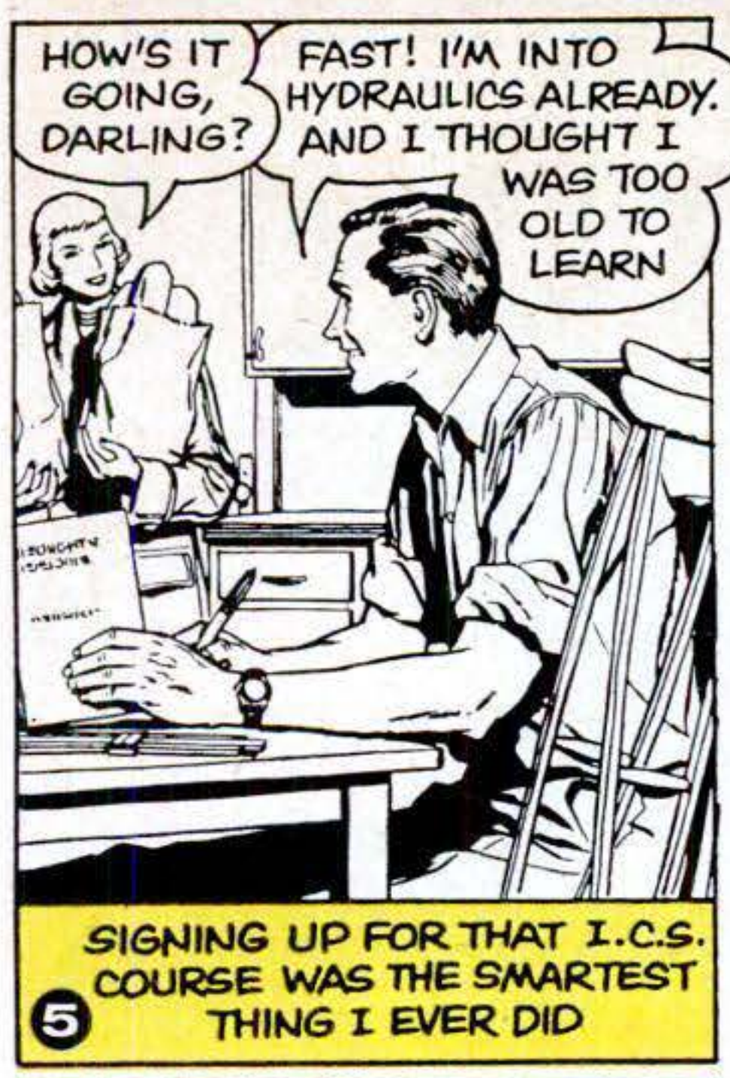

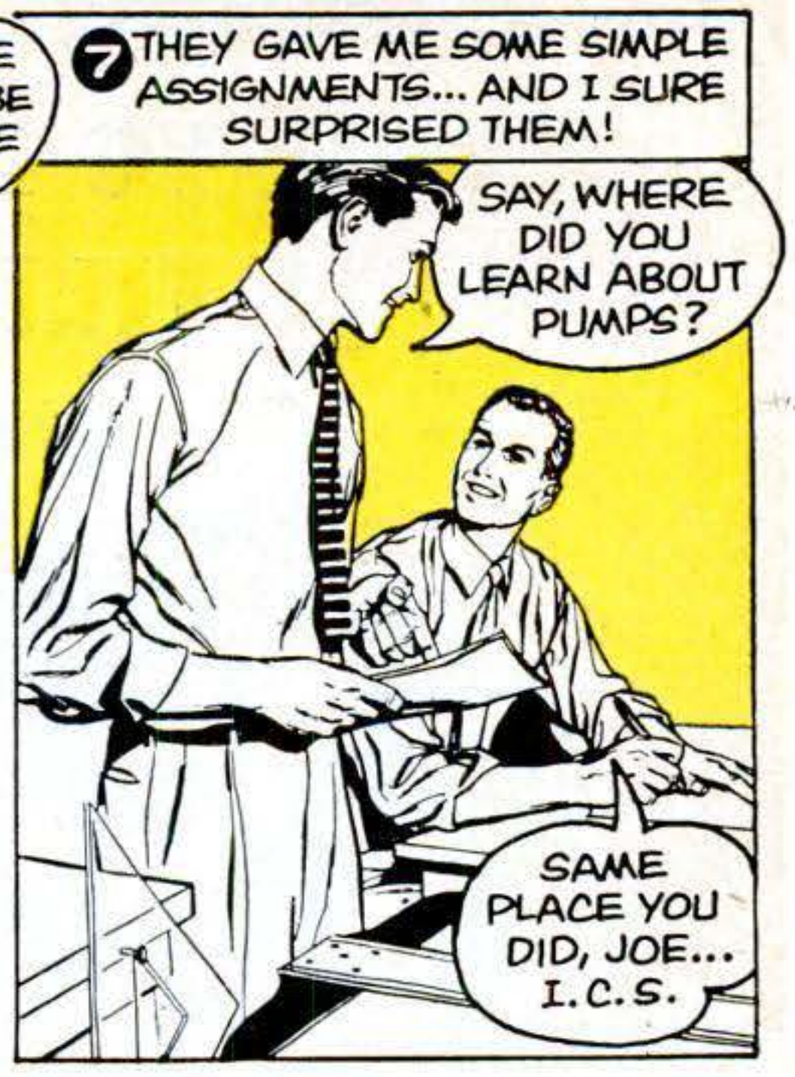

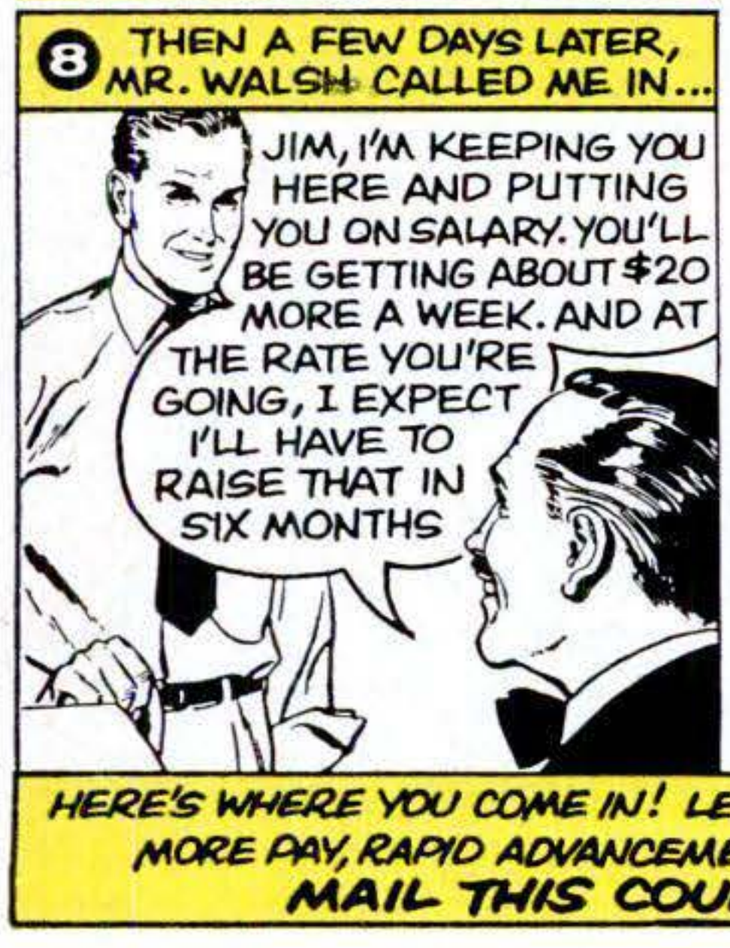

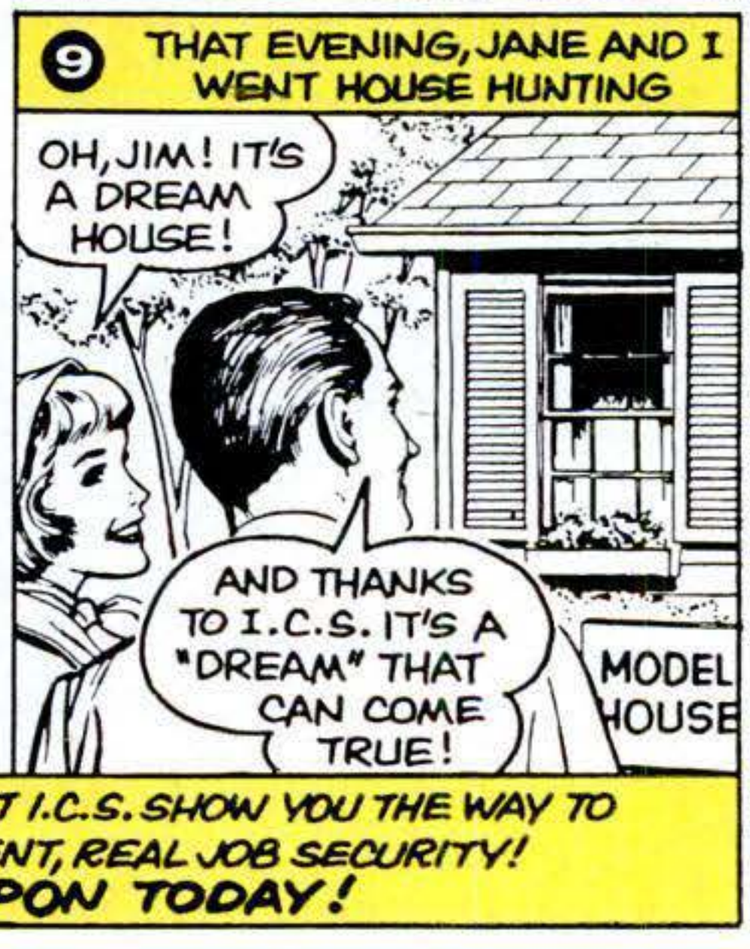

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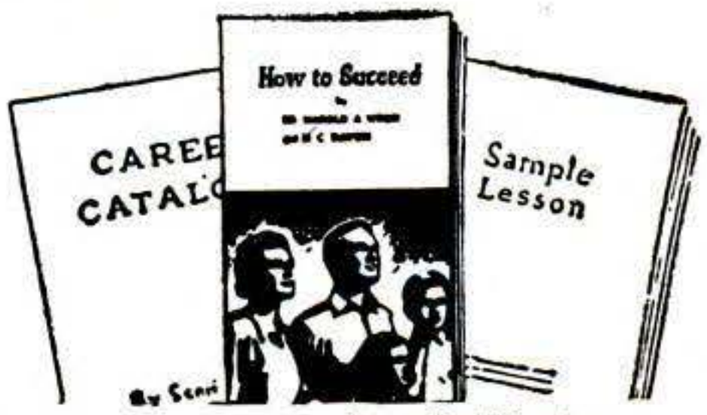

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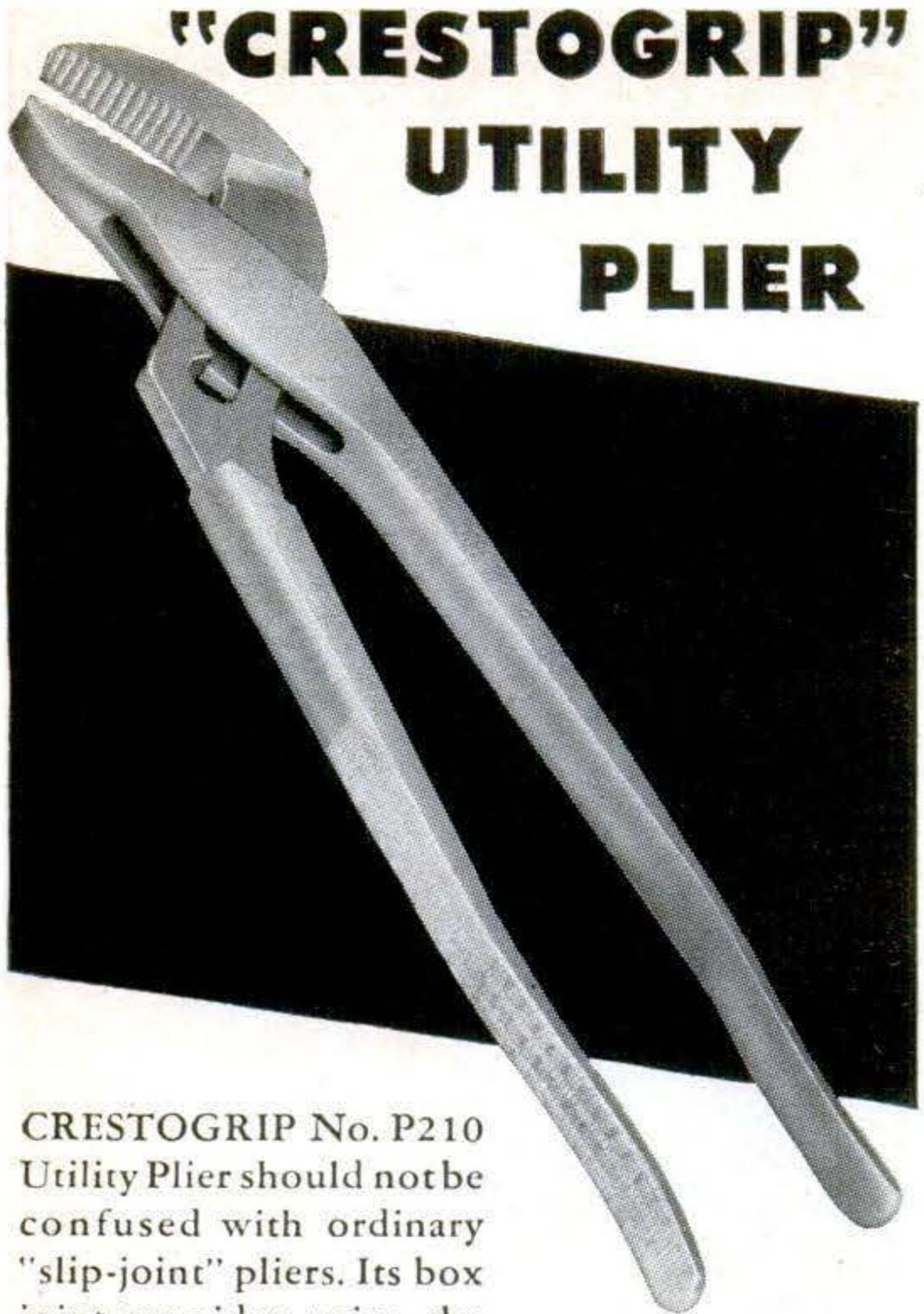

CRESTOGRIP No. P210 Utility Plier should not be confused with ordinary "slip-joint" pliers. Its box joint provides twice the strength of the conventional lap joint and eliminates sideways twist and strain. Grips flat, square, hex or round objects with powerful leverage. Adjusts to four positions up to 1½" capacity. It has no rivet projections and measures only ½" at its thickest point. Finished in rust-resistant zinc plate.

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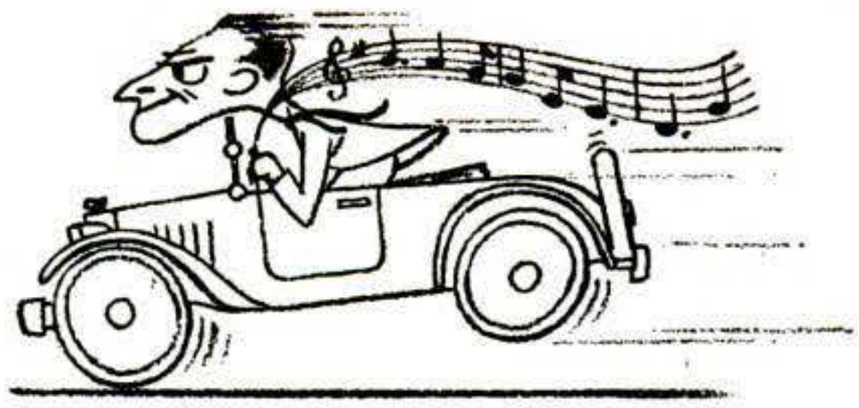
hit 80 (I never saw it work because I don't think his car could go that fast)



the music box was supposed to play—guess what?—"Nearer My God to Thee."

L. C. Robbins, Dallas

Challenges Co-op Pioneer Claim

You state that Antioch College pioneered the "co-op" work-while-you-learn system of education ["You *Can* Afford to Send Your Child to College," Aug.]. As a matter of record, in 1956 the University of Cincinnati celebrated its 50th anniversary of continuous cooperative education at a meeting attended by many leaders of education and industry.

Today U. C. has over 3,000 students in three of its colleges following a compulsory five-year co-op program and has working arrangements with over 500 different firms. We believe that U. C. pioneered the co-op system as conceived by Dean Herman Schneider in 1905.

T. J. O'Leary, Ch.E. '52, Metairie, La.

Mechanical Monsters Made Real

We believe that you have done an outstanding job of describing "The Mechanical Monsters That Build Our Roads" [July]. Because of your efforts, more people will understand what equipment is doing which job on the construction projects that are making the interstate highway system possible.

Paul Price, Caterpillar Tractor Co., Peoria, Ill.

A 1924 Flint Convertible?

While scanning the drawing that illustrated "Gus Tackles an Antique" [May], I beheld a 1924 Flint touring car, and a remarkable one, indeed. The picture shows this Flint with top folded down.

Since I am an owner of a 1924 Flint touring car in original condition, I am curious to know how that top came to be folded down. Mine is a permanent top that will not fold. In reviewing the factory catalogue on the 1924 Flint, which I

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Satisfied with my PRESENT PAYCHECK?

NOT ME!!

TODAY, you are probably earning enough to get by—enough to provide your family with life's necessities, and perhaps you are depositing a few extra dollars in the bank.

BUT are you content with just earning a living wage? Do you say "Someday I'll really get a break and go right on to the top." THAT'S WISHFUL THINKING!

You know that the "breaks" go to the man or woman who is *prepared* to take advantage of them—to the person who can fill the better job and who is worth more money. He makes the "breaks" instead of waiting for them.

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We'll show you how to earn $8,750 clear PROFIT the first year on just 2 jobs a day... personally train you, furnish all equipment.

- **NO SHOP NEEDED**
- **START IN SPARETIME IF NOW EMPLOYED**
- **YOU OFFER 3 SERVICES**

Even if employed, enjoy the prestige and financial independence of your OWN business. We offer a lifetime opportunity to reliable men. You will be trained in your town by a Duraclean dealer, who will reveal the Duraclean System and plans for building business. He helps you get quickly established. Just **2** average jobs a day earns **$8,750 NET profit the first year.** Employ others, MULTIPLY profits. Business grows from recommendations, repeat orders. Under our guidance you become an expert in the care of rugs and upholstery. Easy to learn. We furnish everything.

YOU CAN START FROM YOUR HOME

These are full-time dealerships, but you can start part-time from home. All work done with portable equipment in homes, offices, hotels, institutions. We work with you 12 months of the year, provide 25 regular services to help you build business: **National Advertising** in McCalls, House & Garden, dozen others. **Insurance. Complete Local Ad Kit. Publicity Program** gets free newspaper stories. **Monthly Magazine. Conventions.** Many others.

THREE ways to make money

A Duraclean Dealership qualifies you to offer 3 different services: **1. DURACLEAN:** Famous ABSORPTION process for cleaning rugs, carpets, upholstery. Recommended by leading stores and manufacturers. NO scrubbing, soaking, shrinking. Aerated foam safely removes dirt, grease. Dries so fast, customers use furnishings in few hours! **2. DURASHIELD:** Soil-retarding treatment that KEEPS furnishings clean MONTHS longer. So new you may be first in town to offer this type service. **3. DURAPROOF:** Protects against damage by moths, carpet beetles. Only such treatment backed by an International 6-year Warranty!

Send for FREE Booklet!

A moderate payment establishes your business—pay balance from sales. We furnish electric machines, complete sales material, enough supplies to return TOTAL investment. Our FREE booklet explains urgently needed services, large profit, easy terms, PROTECTED territory. Send coupon **today.**

DURACLEAN CO., 7-18N Duraclean Bldg., Deerfield, Ill.

"OWN a Business" Coupon

Duraclean Co., 7-18N Duraclean Bldg., Deerfield, Ill.
Please rush free booklet and letter giving full details of how I may OWN a growing, lifetime business.

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City ..... State .....

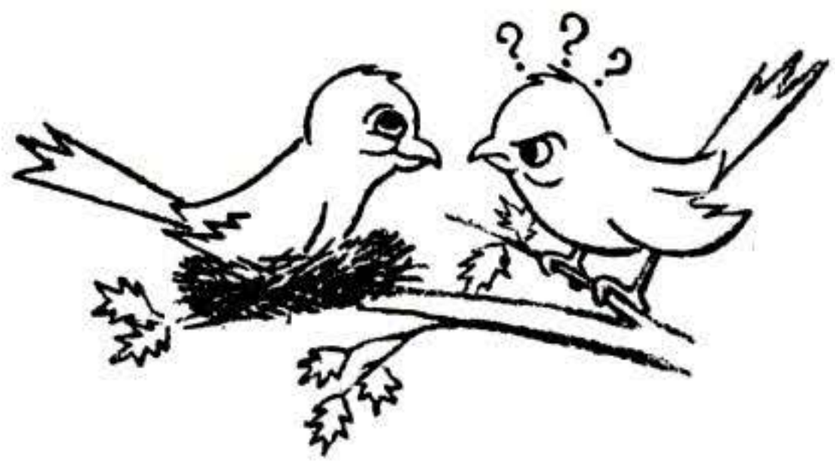
have, I notice that the manufacturer also states that the top is permanent.

DWIGHT L. BIDWELL, Madison, Tenn.

An irreverent artist converted it.

How to Watch a Bird

How on earth did you shoot that photo [Sept., p. 157] showing the radio-controlled camera leering at a bird on his



nest? If you used a second radio-controlled camera, did they both react to the same signal? And what did the bird think of all that equipment zeroed in on him?

JACK SULLIVAN, Cedar Rapids, Iowa

Hard to tell what the bird thought: He was stuffed, rented from a taxidermist as a photo model.

Poignant Reminders

THE timbers of the old house in which I live groaned and creaked at the thought that anyone could forget ["How Disaster Strikes," Sept.] the terrible twisting they took during one fateful day in 1906.

The San Francisco earthquake and fire of April 18-19, 1906, killed 452 persons and caused a loss of $350,000,000, a disaster which would qualify for your list.

S. L. SARTOR, San Francisco

. . . You list the major United States disasters in the 20th century. The note below states "Does not include military action, ships *except when in U. S. ports,* aircraft," etc. Therefore, I take it that the list should include the loss of life on ships when in U. S. ports.

I wonder why you did not include the Eastland disaster, July, 1915, with the loss of 835 lives?

E. F. MCDONALD JR., Chicago

The Eastland overturned July 24th in the Chicago River. There is not even a feeble technicality to account for the omission of the San Francisco earthquake.

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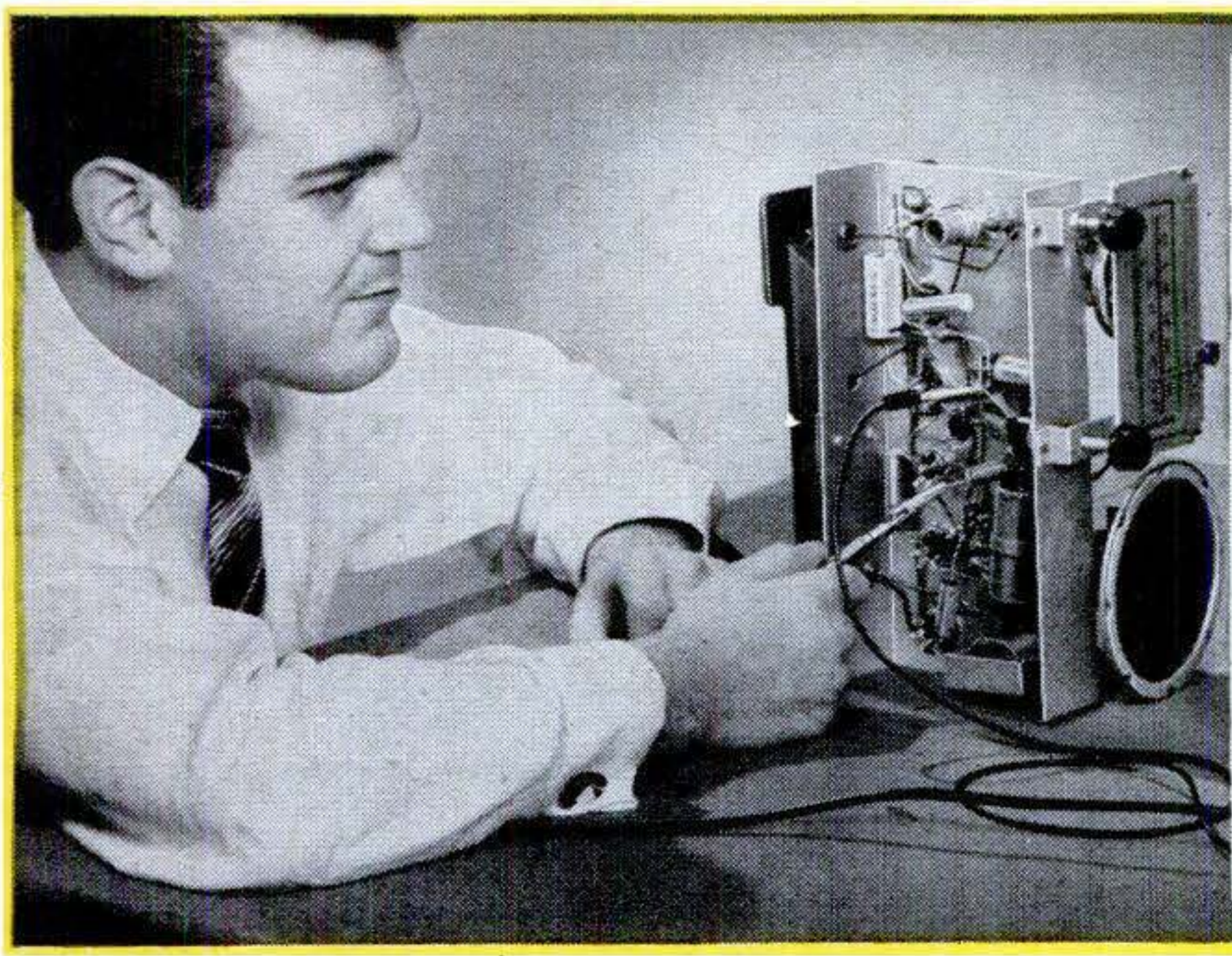
For a Successful Career in Radio-Television



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OLDEST and LARGEST

Home Study Radio-Television School

N.R.I. Trained These Men

ENGINEER STATION WHPE

"Thanks to NRI, I operated a successful Radio repair shop. Now I am an engineer for WHPE." VAN W. WORKMAN, HIGH POINT, NORTH CAROLINA

QUICK SPARE TIME CASH

"Knew nothing about Radio-TV when I enrolled. After 15 lessons started repairing sets. My future looks bright." DONALD B. ACKERMAN, MINNEAPOLIS, MINNESOTA

HAS OWN TV BUSINESS

"Quit my job to do Television work full time. I love it and do all right financially." WILLIAM F. KLINE, CINCINNATI, OHIO

Prosperous Fast Growing Industry Offers You GOOD PAY-BRIGHT FUTURE-SUCCESS

It's the trained man who gets ahead—gets the better job, drives a better car, lives in a better home, is respected for what he knows and can do. For a job with a future—find out how you can train at home for Radio-Television.

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Training PLUS OPPORTUNITY is the ideal combination for success. And today's OPPORTUNITY field is Radio-Television. Over 125 million home Radios plus 30 million sets in cars, plus 40 million TV sets mean big money for trained Technicians. More than 4,000 Radio and TV broadcasting stations offer interesting and important positions. Color television, portable TV sets, Hi-Fi, assure future growth. Find out about NRI. Since 1914—for more than 40 years—NRI has been training ambitious men at home in spare time for Radio-TV. With NRI 50-50 method, you study basic principles AND learn by practicing with actual equipment NRI furnishes. You learn with your hands and your head. You get dependable training, backed up by the reputation of the oldest and largest home study Radio-TV school.

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$10-$15 A WEEK IN SPARE TIME

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You Learn Servicing-Broadcasting at Home—By Practicing with Kits N.R.I. Sends

Nothing takes the place of practical experience. That's why NRI training is Learning-by-Doing. With Servicing Course you build Radio shown at top and other equipment. With Communications Course you build Transmitters at left and other equipment. Catalog shows all equipment you get.

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Regular 49c Size **19½c**

Protects Your Family All Winter for Pennies!

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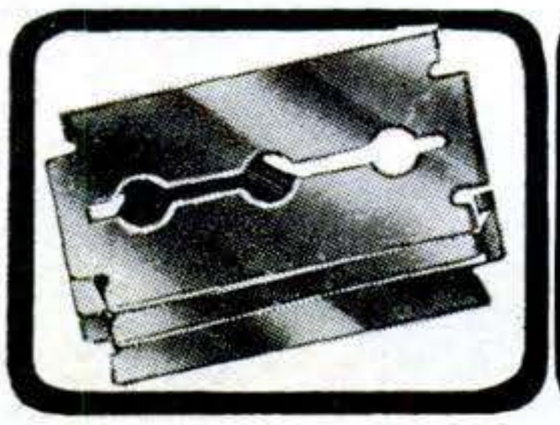


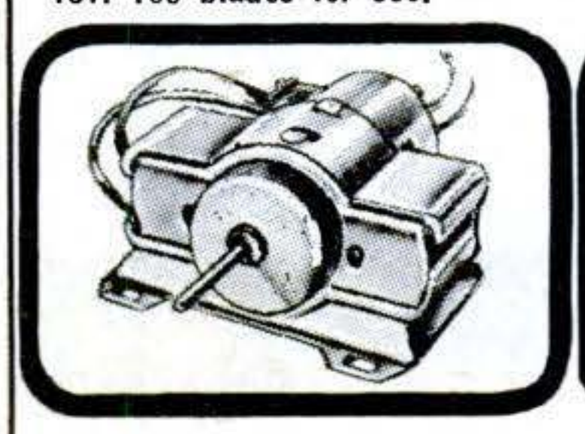
100 BLUE STEEL BLADES 1c EA.

Imagine—not 20 for 98c but 100 genuine BLUE surgical steel blades for only 99c—less than a cent each! New, first-quality—not a close-out! Guaranteed to give same close, keen shaves as brand costing 5 times the price—or money back. Men, why help pay for TV commercials when "everything's the same but the name . . . and the price?" Still not convinced? Send an order. Use 10 blades—full price refunded if not satisfied. Mail coupon on page 13. No. 131. 100 blades for 99c.

New 1958 ZEPHIR

One of World's Thinnest Watches

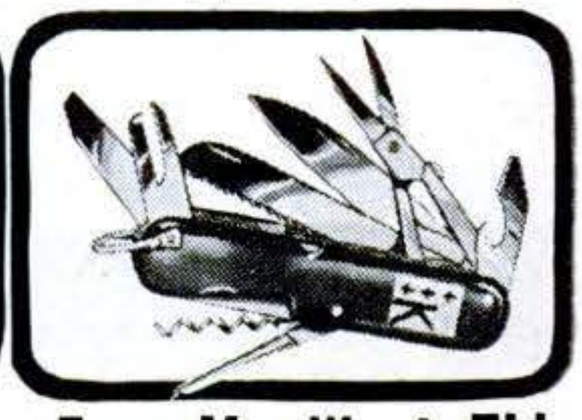
Back in stock! New shipment arrived from Switzerland. Our most fabulous "dress-watch" value. 14 Karat Gold color. Hands and numerals in 14 Karat Gold color too. Wafer-thin! Modern, elegant, distinctive. Guaranteed Swiss movement. Still only 7.98 plus 80c Fed. tax. TOTAL: $8.78 (No. 209). Deluxe model with 14 Karat Gold color EXPANSION BAND $2 more. Total, with Fed. tax, $10.98 (No. 209D)



Electric Motor Drives Model Planes, Trains.

Speeds to 5,600 RPM's.

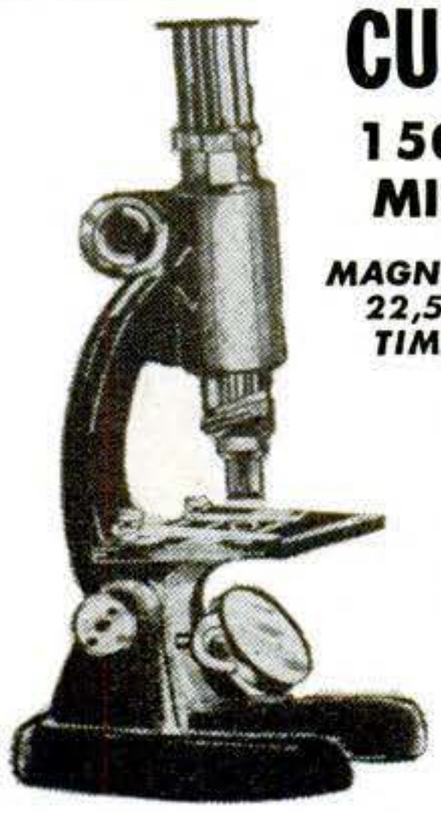
Powerful, rugged, precision-built by master craftsmen. New. Fits palm of hand. Permanent magnetic field, bronze bushing, steel housing and mounting base. Drives model planes, trains, erector sets, small jig saws, wheels, etc. Use for lifting, or hoisting small objects. Keep in tool shop, garage, etc. Works on flashlight battery. Thousands sold —but why pay $2.98? Our price during mammoth Xmas sale—99c each. (Limit: 2 to customer). No. 103. **99c**



Every Man Wants This 10-in-1 SWISS Army Type Knife

SOLD AT $3.98 **1.98**

10 practical, quality tools in one: Saw, File, Knife, Can Opener, Screwdriver, Bottle Opener, Jackknife, Corkscrew, Awl, Scissors. Each separate. Easy to open, use and close. No jamming or slipping. Rugged Korium steel. Replaces multitude of tools & gadgets you can't find when needed. Keep in garage, tool shop, kitchen, basement, car glove compartment. 101 handy uses. 50,000 sold at $3.98—now HALF PRICE! Only $1.98. Stock up now! Excellent Christmas gifts for every sportsman on your list. No. 18



CUT PRICE! 150X POWER MICROSCOPE

MAGNIFIES 22,500 TIMES **4.98**

New! First-Quality! Powerful 150X microscope. Finely ground, polished achromatic lenses. All metal construction. Precision-tooled threading... latest, most scientific design. Ideal for biologists, chemists, technicians, college students, etc. Keep in basement or tool shop. Cut price. $4.98. (Limit: one to customer). No. 23

DuPont Dacron Insulated Jacket

Thoresen scoops America and YOU SAVE $21.05! 100% DuPont Dacron Insulation—not one-ply, not two-ply—but 3-PLY insulation! Jacket weighs 30 ounces yet gives same protection as 20 lbs. of garment! No bulk. No excess weight. You move freely, crouch, bend. Jacket is extra-full cut. It's wind resistant, water repellent, mothproof, dustproof, non-allergic. It's 100% washable. Dries fast. Needs no ironing. Handsomely tailored poplin outer fabric. Full lined inside. Rustproof lifetime extra-heavy Talon Zipper—won't freeze! Two huge roomy side pockets—insulated for hand warming—with two big flaps with snap closures for extra protection. Storm collar has adjusting snap positions. Knitted cuffs for snug-tight protection. Self-adjusting elasticized nylon cord at hips stops cold from "creeping" in. Usually $49.95—but Thoresen cuts the price to only $28.88. You SAVE $21.07! And you get same guarantee as if you paid full purchase price. Wear it 10 days. Money back if not satisfied. Fireman red only. Sizes: Extra Small (32-34); Small (36-38); Medium (40-42); Large (44-46); Extra Large (48-50). Order by No. 59. Matching Hood—only $3.95 ($5.00 value). Order by No. 59

Made to Sell for $49.95!

28.88

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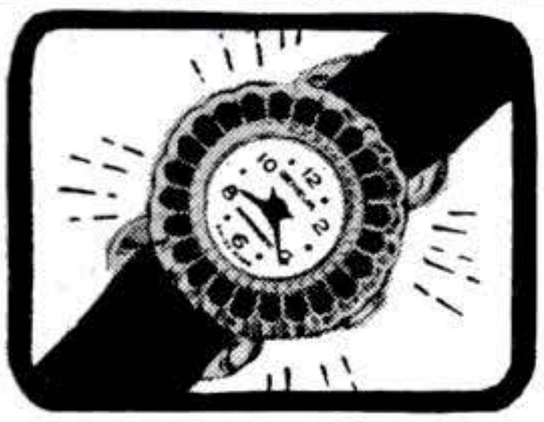
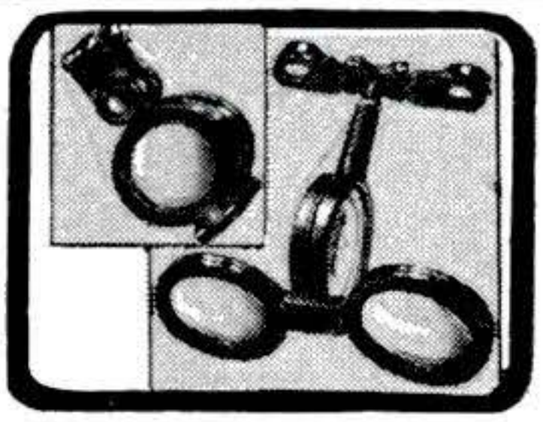
DOLLAR XMAS SALE



Ladies Cocktail Watch Featured by 5th Ave. Jewelry Shops!

9.95 PLUS TAX

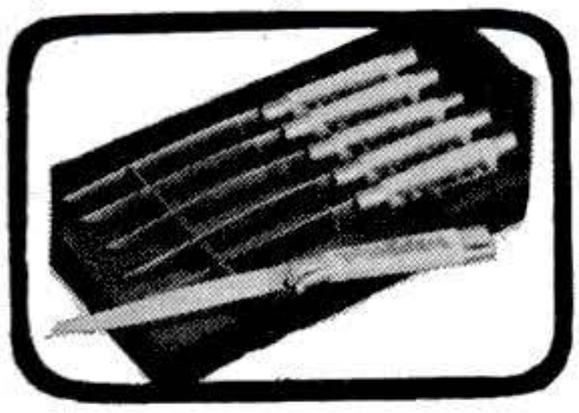
Masterpiece of high fashion. Natural gold color case, numerals and hands, 100% tarnish proof. Barely larger than a dime. Hand sculptured effect with 24 sparkling mock gems. Accurate anti-magnetic movement electronically timed by honored Swiss watchmakers. Gift boxed. Sale price: $9.95 plus 99c Federal tax. Total: $10.94. State color gems desired: Ruby-red, emerald-green, sapphire-blue. Suede strap in perfect matching color. NO. 207.



Foldaway Binoculars From W. Germany

Reg. 2.98 **1.69**

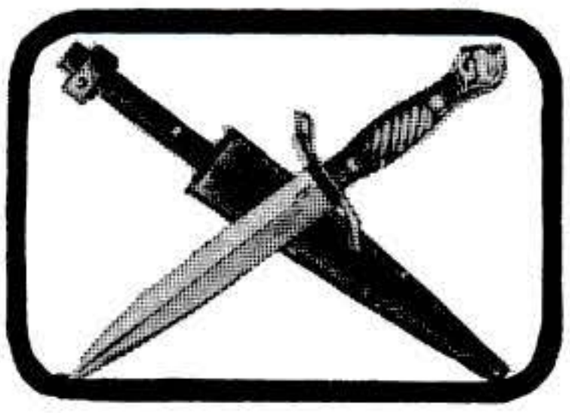
Clever! Unusual! Practical! Fits in pocket or purse flat. Snaps open, folds shut. 8 instruments in one. Binoculars, Magnetic Compass, Magnifying Mirror, Reading Glass, Telescope, Laryngoscope, Stereoscope and even Sun Dial Watch. Precision-import from Western Germany. Thousands sold at $2.98—now only $1.69 while supplies last.
NO. 93 .....$1.69



SOLINGEN STEAK KNIVES

without box **33c**

Formerly $2.00 each, As advertised in House Beautiful, The American Home, Esquire, etc. Solingen stainless steel steak knives. Serrated edges. Never need polishing or sharpening. New, first quality. Gold & ivory hue handles. Truly beautiful. One million already sold—now one low price! 10-year replacement certificate. Stock up now. New shipment from West Germany will cost more. 3 for 99c, 6 for $1.96, 12 for $3.96. Free Cake Server with 12 knives. NO. 89.



Black Forest HUNTING KNIFE

Form. $3.98 **99c**

Red-hot bargain! Formerly $3.98. This handsome replica only 99c plus 26c for scabbard. Total: 1.25. Nearly 10 inches long. Korium steel blade sharp enough to shave with. Beautiful sculptured-effect! A champion in the field or as wall decoration. Order several. NO. 76. .....1.25

Rugged New 1958 Thoresen WATER & SHOCK RESISTANT WATCH

Compare with Models Ticketed at $49.95:

7.98 PLUS TAX

- Stainless steel back
- Anti-Magnetic
- Imported from Switzerland

UNLIMITED GUARANTEE
exclusive of parts
Repairs on watch, if ever needed, absolutely FREE. Never a charge for labor, handling, adjusting, etc. for the LIFETIME of this firm! Guarantee given in WRITING!

We've sold over 200.000 watches in recent years but this is our most fabulous value! Handsome, rugged Thoresen 1958 Water & Shock Resistant watch—engineered to rigid Swiss precision standards—yours for only $7.98 plus tax! Bang it! Jolt it! Wet it! The Genova is MULTI-PROTECTED. Resists shocks at work or play. Sealed-in safeguard gasket resists water, grime, dust. Yes! It actually runs under water!
*Compare the Genova with watches selling today up to $49.95 for its elegant, very thin design, its modern applique dial, its smart, distinctive looks, its truly durable construction. Don't let our low price confuse you. The Genova is precision-made by honored Swiss watchmakers famed for their high standards of craftsmanship! Even if we were to charge you TWICE the price, we couldn't give you a more accurate timepiece! Wear the Genova on hunting, fishing, camping trips; at home; at work; at play. It's built to take rugged use! It makes an excellent gift for any any man, any age!
And remember, even at this low price you receive the famous THORESEN guarantee of FREE service, FREE oiling, FREE adjusting, FREE labor. (See guarantee certificate above.) This guarantee is good not for one year, not for two years—but for the lifetime of this firm! We have a full-time jeweler and watch service department to cater to your needs.
No. 260 Genova with leather strap. $7.98 plus 80c excise tax. TOTAL $8.78.
No. 260D Genova with metal expansion band $1.22 more. TOTAL: $10 taxpaid.

NEW POWERHOUSE "77" from West Germany

2.98

***40 MILE VIEWS!**

New 1958 Powerhouse "77" arrives just in time for Christmas giving! Now better than ever. New modern design. New faster focus. Sharper, better, clearer views—day or night! Take to football games, hockey matches, the races, on hunting, camping trips. You would expect to pay at least $5.00 for these power binoculars—but Thoresen imports from West Germany by BOAT-LOADS! We pay less. You pay less. NO. 160 .....2.98
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☐ Send C.O.D. plus postal fees (NO C.O.D.'s under $1.98).

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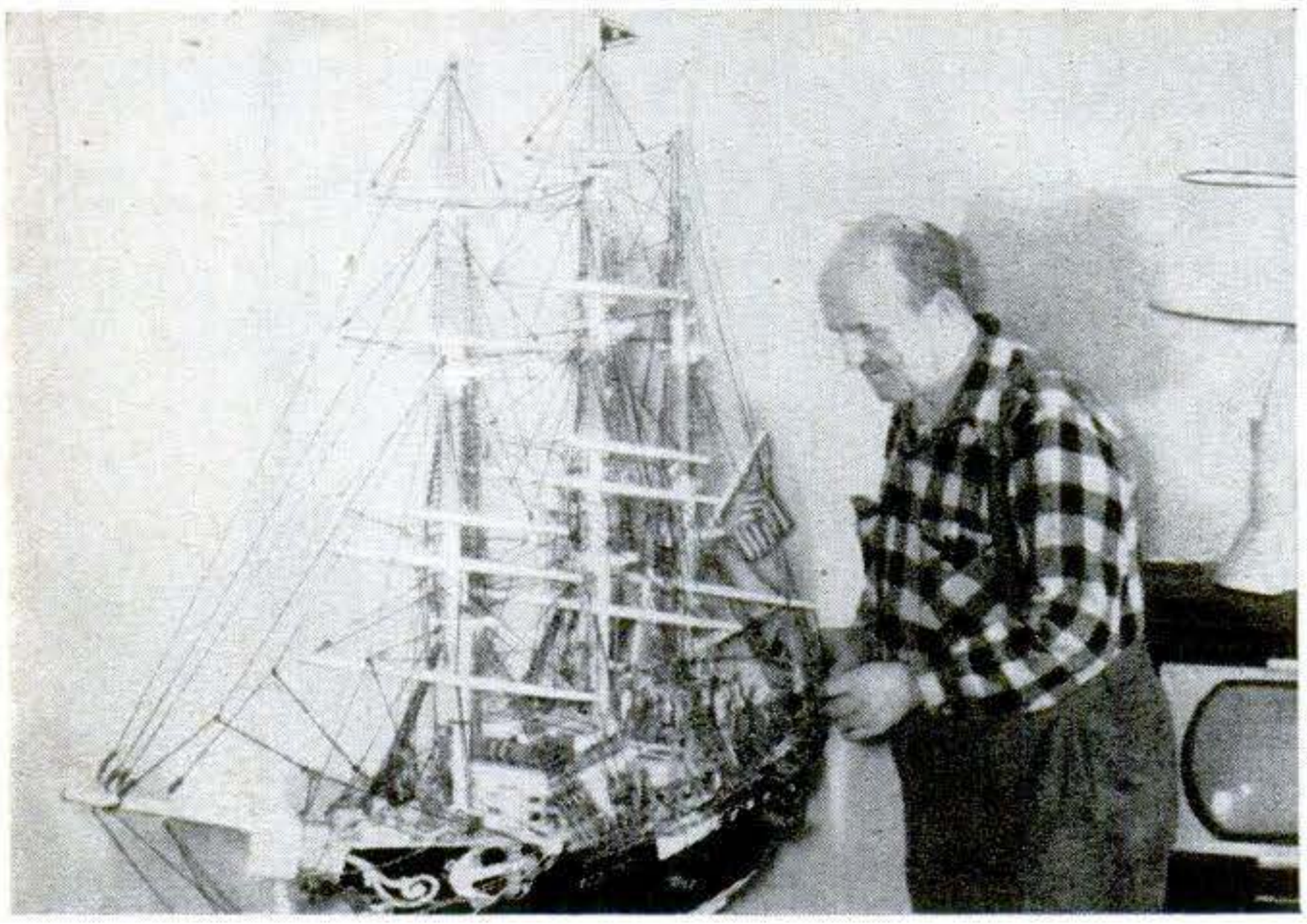

Whale of a Model. When Orlando Milani of Chicago started a ship model, he laid the keel for a big one. His 135-pound whaling ship is five feet long and has a 12½-inch beam. Single-ply oak veneer laid up an inch thick made the hull and 1,000 feet of cord went into the rigging. The wheel really moves the rudder, and the Maria's cargo-loading derrick, lifeboat launchers and two chain-hung anchors are working parts, too.

Old Weapon Updated. This crossbow is aimed through a peepsight and fired by trigger action like a rifle. It shoots harpoons as well as arrows, and Karl Traudt of Babylon, N. Y., has bagged sharks with it. He made the bow of reinforced plastic. A car's bumper jack supplies the 500-pound pull needed to twang the stainless-steel wire that strings it.

Little Chest Holds a Lot. John J. Williams of Albuquerque, N. M., built this moth-frustrating box small, but it does a big job. In a climate where hot days are often followed by chilly evenings, it keeps knitwear safe yet handy.

Boards of butt-jointed red cedar over a mahogany frame make a short chest—22 inches—but one that holds 18 sweaters.

Have *you* recently completed a workshop project of which you are particularly proud? Send a good photograph of your work, along with the negative and a brief description, to the Mechanics and Handicraft Editor, POPULAR SCIENCE, 353 Fourth Ave., New York 10, N. Y. We will pay $15 for each item that is accepted for publication.

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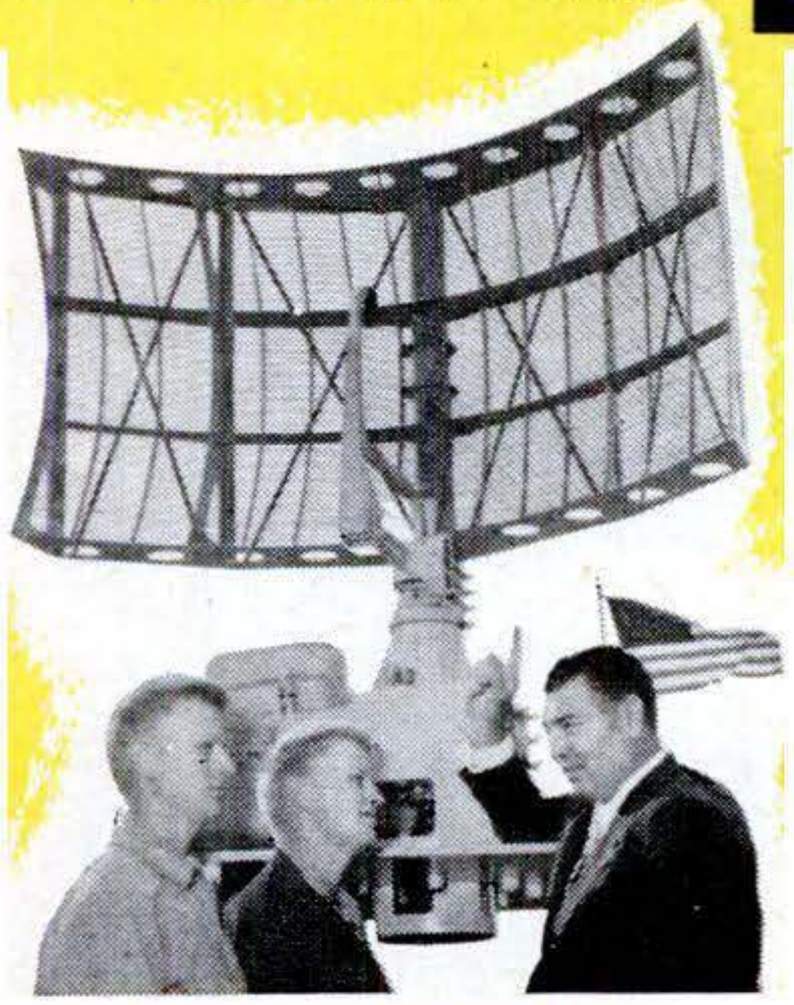
DeVRY TECH SPECIALIZES IN PREPARING THE UNTRAINED MAN

At Home... TO BECOME AN ELECTRONICS TECHNICIAN



DeVRY TECH INSTALLS COMPLETE RADAR SYSTEM

DeVry Tech students use real commercial-type equipment in their training—the same type they will use on their jobs after graduation. Jack Dempsey, former heavyweight boxing champion, who is Director of Public Relations, inspects the antenna of DeVry Tech's Radar Unit, on the roof of its Chicago resident school.

TWO WELL-EQUIPPED TRAINING CENTERS

If you can come to Chicago or Toronto, you can train for many opportunities under the close guidance of friendly, experienced instructors. You use valuable commercial equipment for "on-the-job-type" training. Send coupon for details.

LIVE-WIRE Employment Service

DeVry Tech's Placement Department is in contact with some of the best-known employers in the Electronics field. The service is free to all graduates — and DeVry Tech's record in helping to place men has been outstanding.

DRAFT AGE?

DeVry Tech has valuable information for men of draft age; so if you are subject to military service, be sure to check the coupon.

"One of North America's Foremost Electronics Training Centers"

NO PREVIOUS TECHNICAL EXPERIENCE OR ADVANCED EDUCATION NEEDED

Your job of today and your experience of yesterday are not as important as your ambition for tomorrow! If you would like to prepare to become an Electronics Technician, in your spare time and without interfering with your present job, read these facts: Laborers and bookkeepers, store clerks, farmers, salesmen—men of nearly every calling—have taken the DeVry Tech program and today have good jobs or service shops of their own in some branch of Electronics. Here's proof that it can be done. If you are 17 to 55, we will tell you free how you may prepare for exciting, interesting jobs in Automation Electronics, Radar, Guided Missiles, Communications, Industrial Electronics, etc Here is a chance of a lifetime to prepare to cash in on one of today's fastest growing fields. Mail the coupon for free facts! DeVry Tech's practical home method enables you to get the same type of basic training and equipment as used in our Chicago and Toronto training laboratories—among the finest! Send coupon NOW!

INDEX to a Better Job and a Brighter Future in These Newer Opportunity Fields

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DeVry Technical Institute
4141 Belmont Ave., Chicago 41, Ill., Dept. PS-11-N

Please give me your FREE booklet, "Electronics and YOU," and tell me how I may prepare to enter one or more branches of Electronics as listed above.

Name _____ Age _____
Please Print

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City _____ Zone ___ State _____

☐ Check here if subject to military training.

DeVry Tech's Canadian Training Center is located at 626 Roselawn Avenue, Toronto 12, Ontario.

#2001

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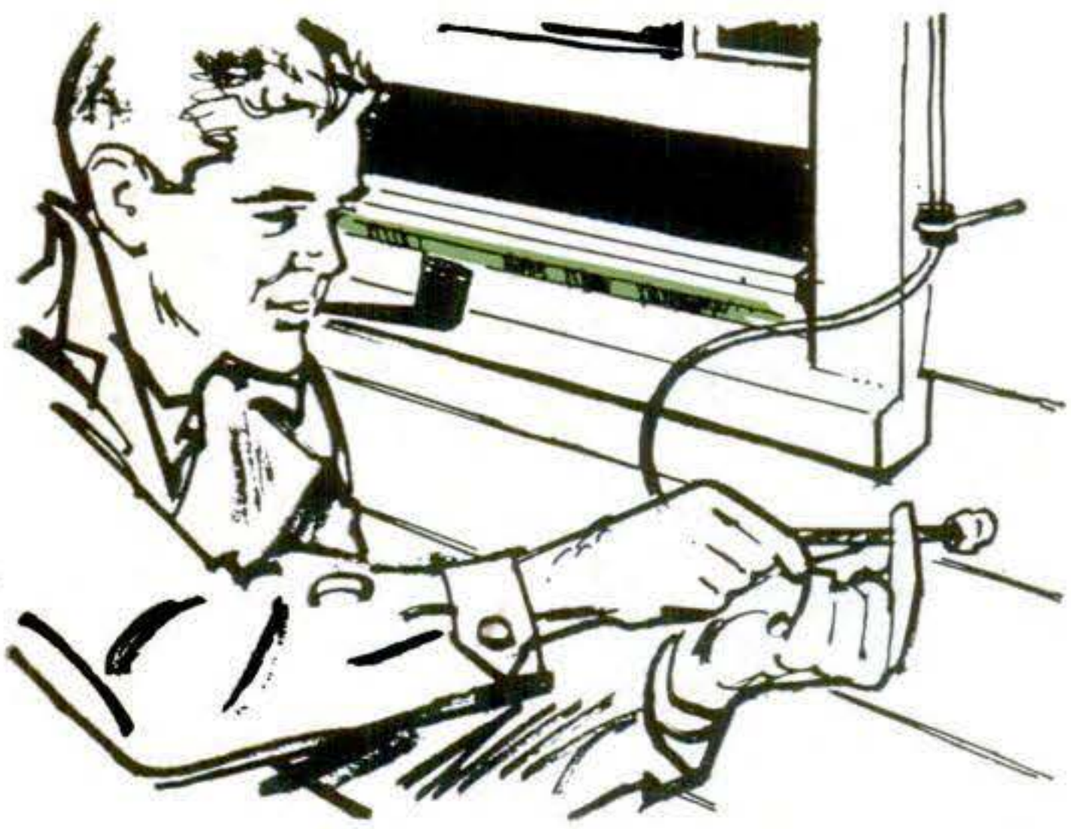
Keeping the Home Shipshape

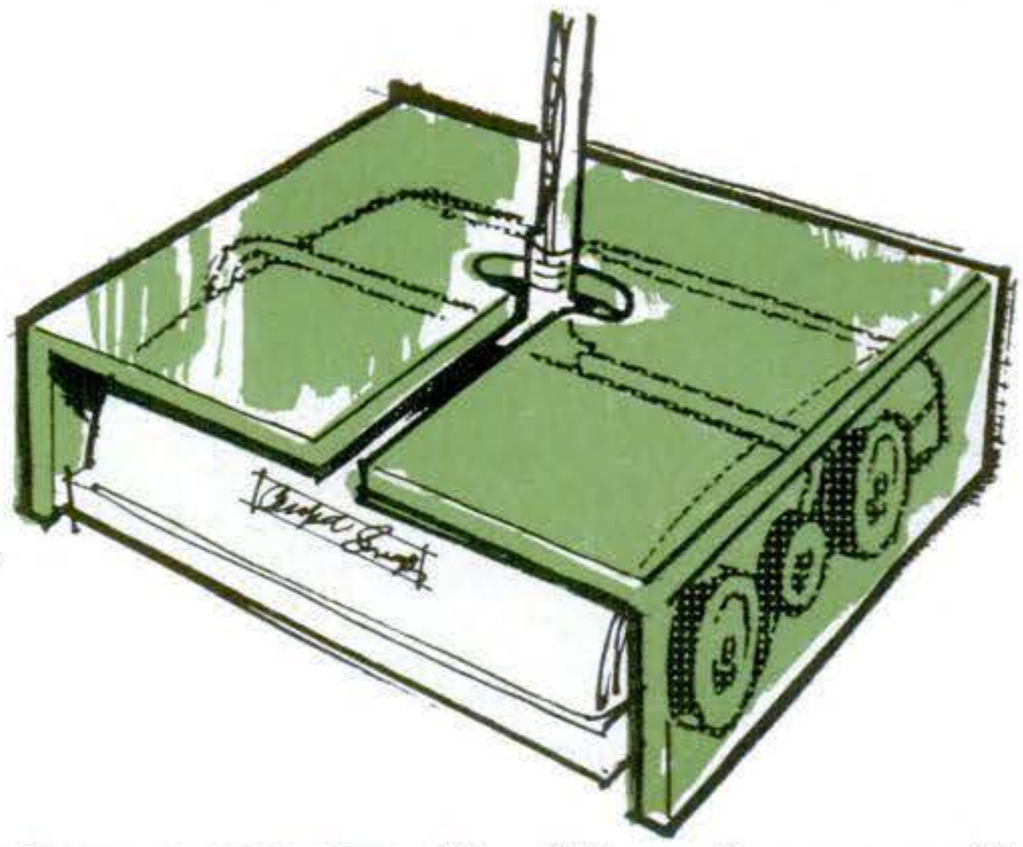
STUBBORN CAPS, even those on syrup bottles, come off easily if expanded by heat treatment. Just hold the cap over a stove burner or under a hot-water faucet a few moments.

A TUBULAR CHAIR can be made taller in a hurry when a young visitor comes to dinner. Just remove the rubber or metal caps, and wedge tapered wood dowels into the hollow legs.



USE A THROUGH-THE-WALL-FITTING to run a TV antenna lead into the house if you have metal weatherstripping. Wires crossing the metal will impair both reception and the heat seal.

BREAKING OUT THE WINTER WOOLENS? You can salvage unevaporated moth cakes or crystals. Store them in an airtight jar or heat-seal them in a freezer bag for re-use next spring.



STORE A SWEEPER like this and you provide the closet with a step-stool, too. Stand on the rear of the box and push the sweeper handle into the cross slot for a balancing rod.

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COLOR TV

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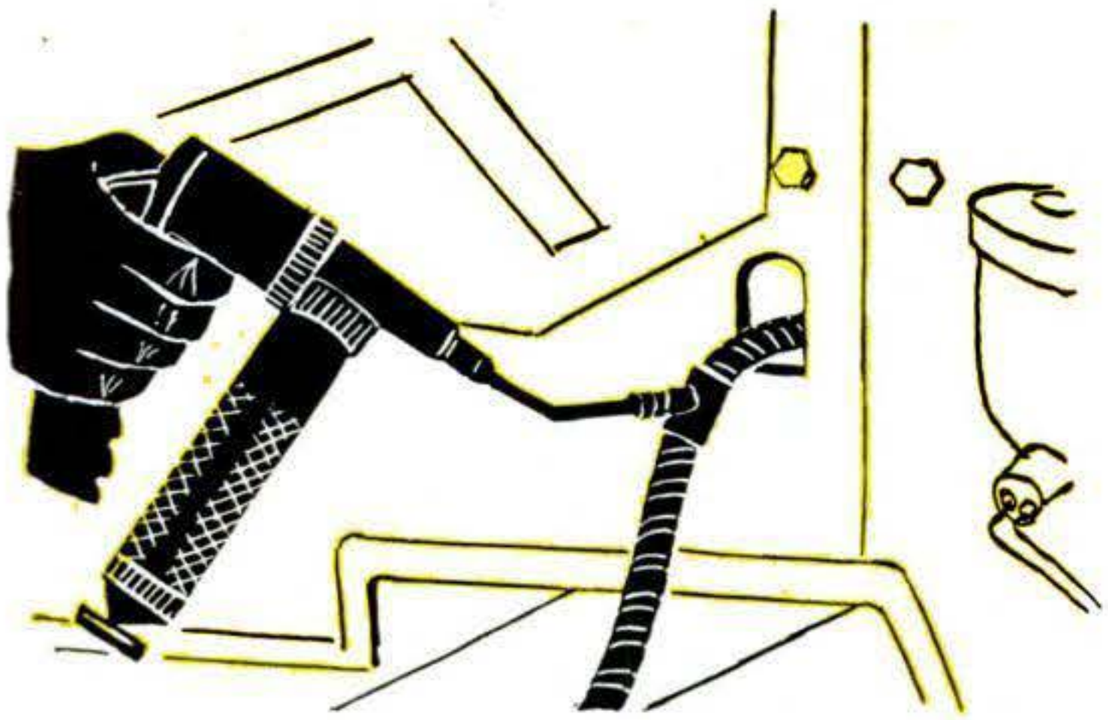
"I'd like to see them make..."

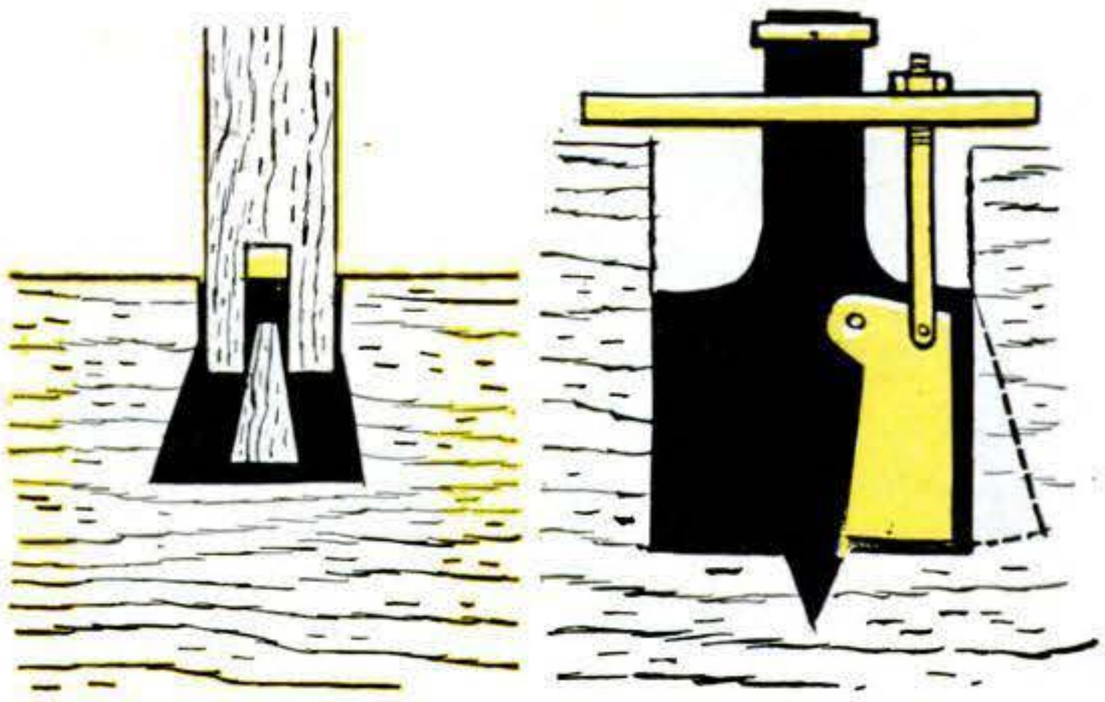
CLIP-ON FLASHLIGHTS FOR VACUUM CLEANERS, to light up attachments that cannot readily be wired from the cleaner. They'd help you see into dark corners.—*Dick Pray, Grossmont, Calif.*

POWDERED-COFFEE DISPENSERS like those drugstore headache-powder dispensers. They'd hold the upended bottle and measure out a spoonful at a time.—*D. Woodman, Meadowbrook, Pa.*

IMITATION COLONIAL WINDOWS to make washing and painting less of a chore. A snap-in framework would lift off each side of one big pane of glass.—*R. E. West, Rutherford, N. J.*



SPEEDOMETER CABLES WITH A GREASE FITTING near the firewall. Then if there was any noticeable noise from within, a grease gun could quickly silence it.—*John Schalk, Detroit.*



A DOWELING BIT for electric drills. An inset blade would work out gradually to widen the hole as a collar on the shank bears against wood.—*B. L. Honeycutt, Nashville, Tenn.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

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HELP YOURSELF to a BETTER JOB!

I'LL TRAIN YOU AT HOME TO BE A HIGHLY-PAID MECHANIC IN AIR CONDITIONING AND REFRIGERATION

R. C. ANDERSON
President
CTI

It has been one of America's great industries for years—but the way it's growing, you'd think it was in its infancy! That's why the air conditioning and refrigeration industry appeals so strongly to ambitious men who want better jobs, more security, higher pay.

Over 150 million refrigerating units are in use today—are in need of repair and service. Each year, 3 million refrigerators, 1 million freezers and 2 million air conditioners are produced. Not only homes, but stores, offices, restaurants, motels and transportation systems use some form of refrigeration. Even autos are being made with air conditioners. No wonder trained men are in big demand—are so well paid! Want to be a mechanic in this field? To find out how, *just mail coupon for valuable free information!*

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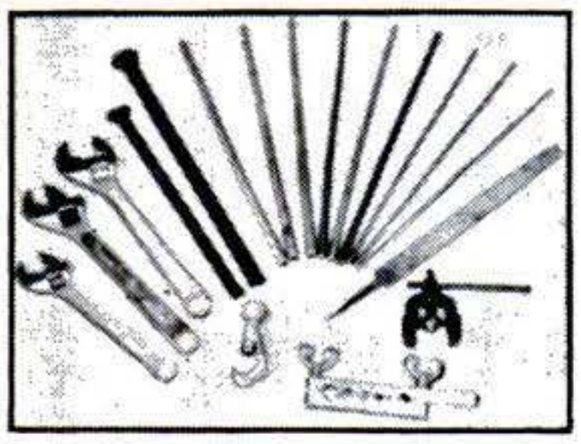
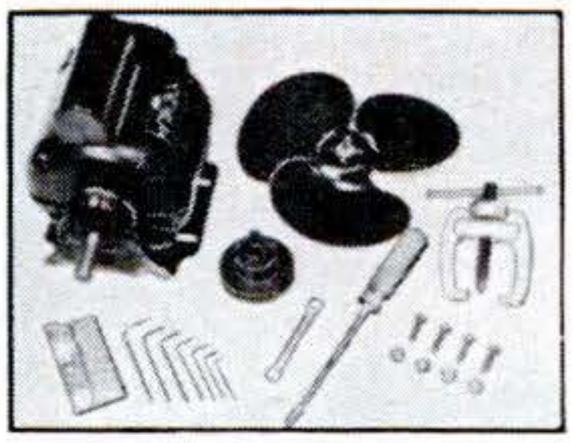
After years of research, CTI has developed a wonderfully effective training plan. It enables you to train at home in spare time. *You get 23 big kits* to build an air conditioner, refrigerator, freezer or milk cooler. You keep all this equipment. *You do 10 service and trouble-shooting jobs.* CTI brings field training right into your home! You get practical experience as you learn.

YOU GET EXPERIENCE AS YOU TRAIN BECAUSE YOU PRACTICE WITH COMMERCIAL EQUIPMENT

You get all parts and tools to build a heavy-duty, commercial-type, ¼ h.p. refrigeration high-side (illustrated at right.) You receive lesson material which not only makes kit assembly *easy,* but downright *fascinating!* Remember, kit training in this field is a CTI "FIRST"





Above left is photo of special tools in just one kit. In another kit (right) you get motor, fan, pulley, service tools. You get other tools, tubing, much equipment, all of finest quality. Kits are sent on a planned schedule so that you learn in easy stages. Kit training develops skill, provides experience, speeds training.

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St. Petersburg . . . . George and Cliff's Hdwe.
Tampa . . . . . Tampa Hdwe. Co.

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Cambridge . . . . . The Phillips Hdwe. Co.
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Port Chester...Litehouse Builders Sup. Co.
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You ought to know...

Does it pay to shell out tolls for the turnpike? Or will you save money at little cost in time if you shun the pike and ride the free highways alongside it? The answer, from one test:

The toll road saves a lot of time and some money.

Two American Motors test drivers made New York-Chicago round trips in identical Ramblers, one on the pikes (New Jersey, Pennsylvania and Ohio Turnpikes and Northern Indiana Toll Road), one on U.S. Routes 22 and 30. The chart shows how they fared.

TEST SHOWS TURNPIKE SAVINGS

Chicago-New York Round Trip	Turnpikes	Free Highways
Driving Time	30 hrs. 15 min.	40 hrs. 49 min.
Average Speed	55 m.p.h.	41 m.p.h.
Gasoline Mileage	30.14 m.p.g.	29.62 m.p.g.
Gear Shifts	82	916
Brake Applications	36	772
Traffic Stops	25	266

Besides the whopping time gain—**five hours knocked off a 20-hour trip**—the pike saved some gas and much wear and tear on the car.

Brakes and transmissions benefited most. **Using the turnpikes, you should cut brake wear to 1/20, transmission wear to 1/10 of that encountered on the free roads.**

Small-car talk is still hot in Detroit. One report: GM may import for U.S. sale still another of its foreign economy vehicles. It's the Holden, designed in Detroit but now made in Australia.

The story is this: Right after World War II, Detroit wasn't sure whether American drivers wanted plain-jane transportation or jet-speed boudoirs. **Both Ford and GM worked up austerity cars and hand-built prototypes.** But extravagant cars won the day. The Ford still molders in a dark corner.

GM—never one to waste even the pig's squeal—shipped its prototype to Australia, and ordered production there. The Aussie reaction: smashing.

Queried about the Holden rumor, GM told POPULAR SCIENCE: "Not true. We're two years behind on orders in Australia."

But this may mean only inadequate production—a lack that GM is expert at fixing. **If the Opel and Vauxhall (reported on in October PS) do well this year, look for the Holden to join them in GM showrooms.**

Adding fuel to the small-car blaze is the hard fact of 1958 economics. A new car will squeeze your wallet three ways (you

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You ought to know...

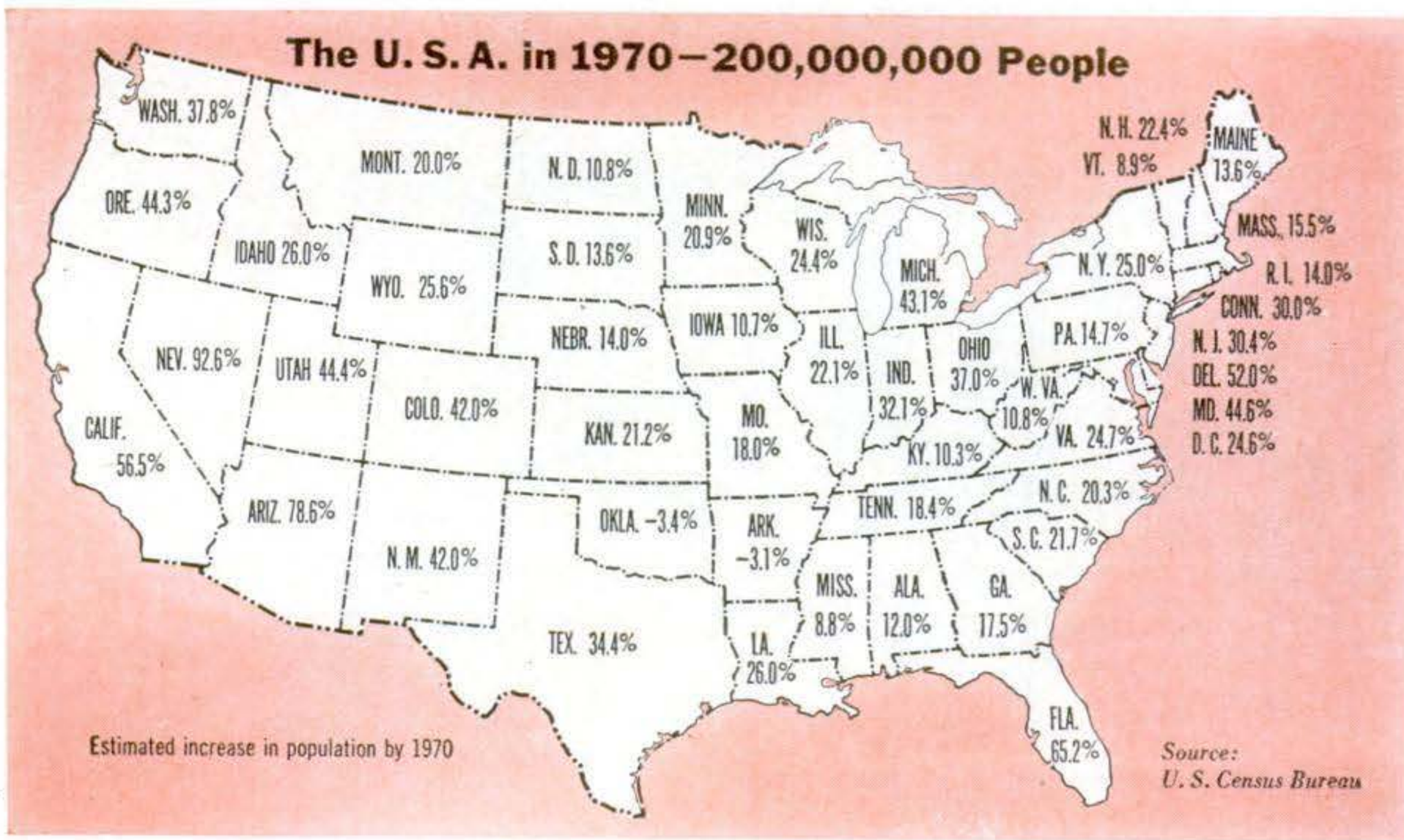
can blame inflation and the Government's moves against it):

1. **Factory prices are higher,** the increases averaging $100.
2. **Your dealer will pay more interest** on the money he borrows.
3. **You'll pay more for financing** (tight money again).

All these things add up. **You may be stuck for a total of $150 or more** over what a comparable '57 model would have cost.

The population pattern is the tip-off on schools, roads, hospitals. Are we over the hump? Or will we need more and more, year after year? The answer depends on where you live.

By 1970, the Census Bureau figures, **there'll be 30,000,000 more people in the U.S.** But the growth will be uneven—Nevada,



for example, may double its population (chart gives estimated percentage increases in population, 1970 over 1955).

If you live in a state that is growing fast, brace yourself for rising taxes. There will be a lot more children, a lot more automobiles. Brand-new schools and roads will be overcrowded.

If you live where population is growing slowly or not at all, expect pressure for schools and roads to ease up. **But a new need will face you: facilities, programs for older people.**

Why? The proportion of oldsters jumps sharply as population growth slows. And people live longer nowadays.

The Russian satellite sleeper wasn't such a surprise to regular readers of "You Ought to Know." Last August this column said: "U.S. scientists are much more sensitive about Russian competition than they like to admit. And they're worried lest the Reds score an honest first in the big satellite race." Exactly.

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Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

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A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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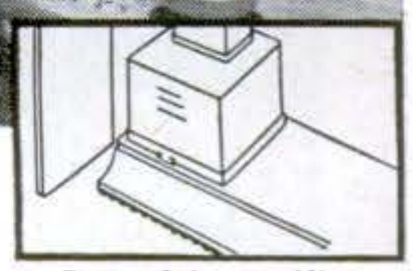

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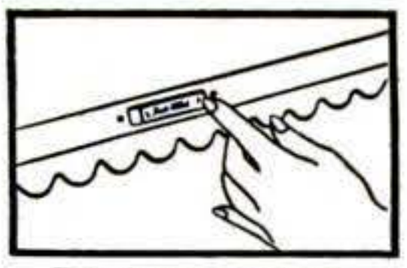

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Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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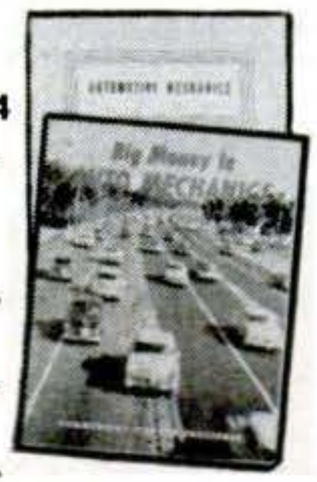

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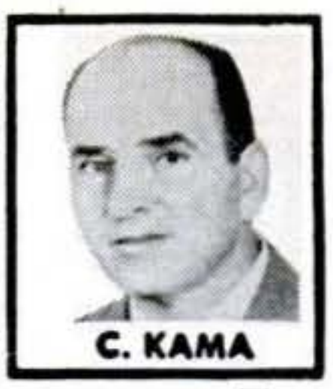
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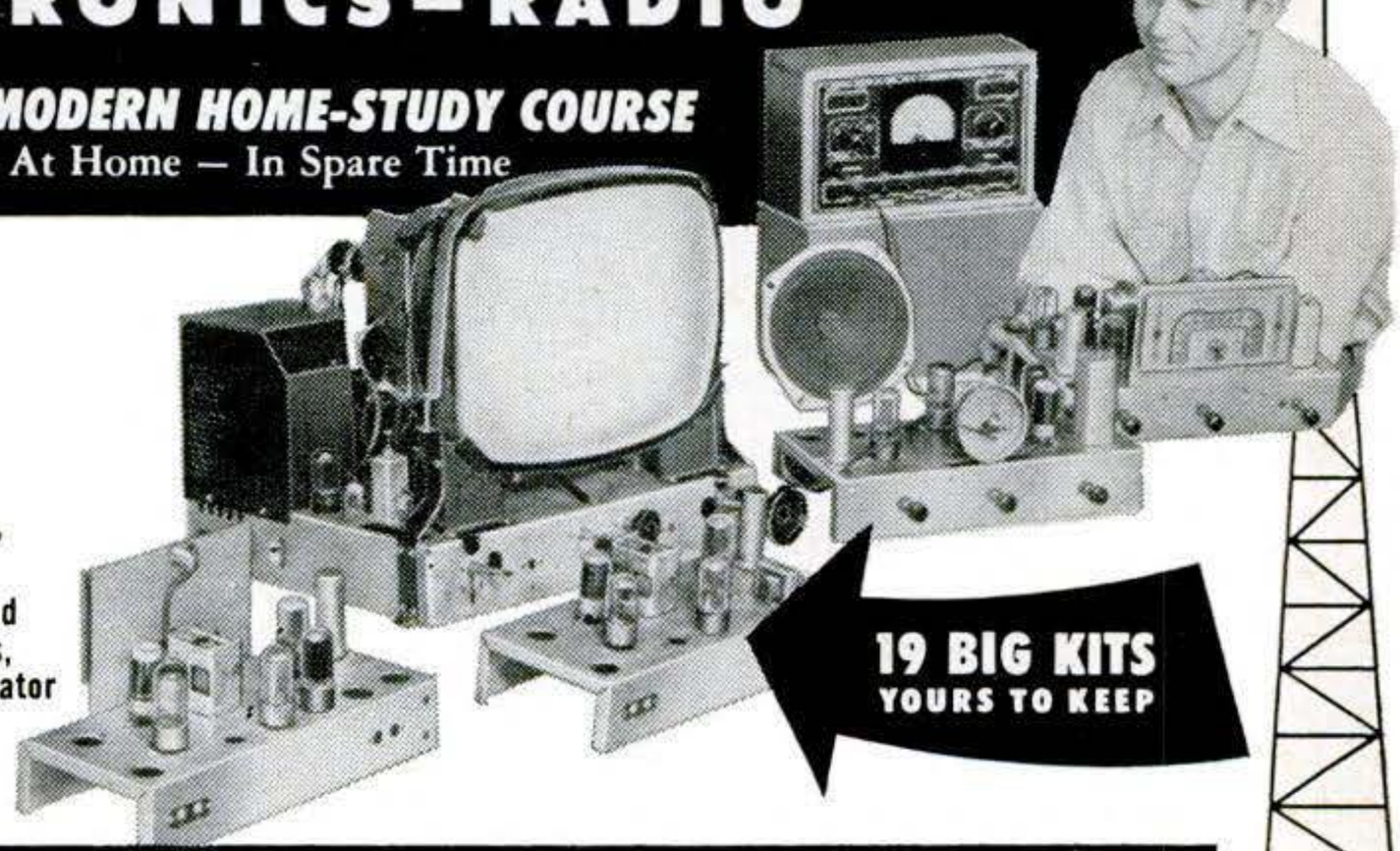

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Mail your disclosure to the registered patent attorney or agent whom you select to assist you, together with a letter authorizing him to conduct a preliminary search among previously granted U. S. patents for similar types of invention. He then prepares for you a report on the probable patentability of your invention and, if the report is favorable, recommends the further course you should take.

This firm is registered to practice before the U. S. Patent Office and is available to assist you in the preparation and prosecution of patent applications. We shall be glad to send you without obligation, the "Evidence of Invention" disclosure form mentioned above and our instructive booklet, "Patent Protection for Inventors"

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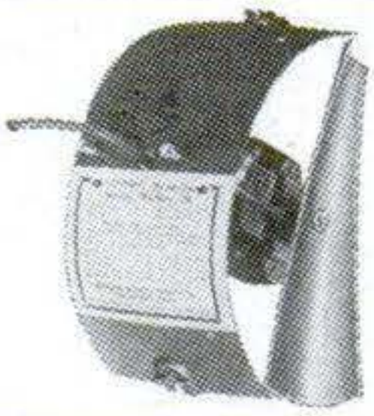

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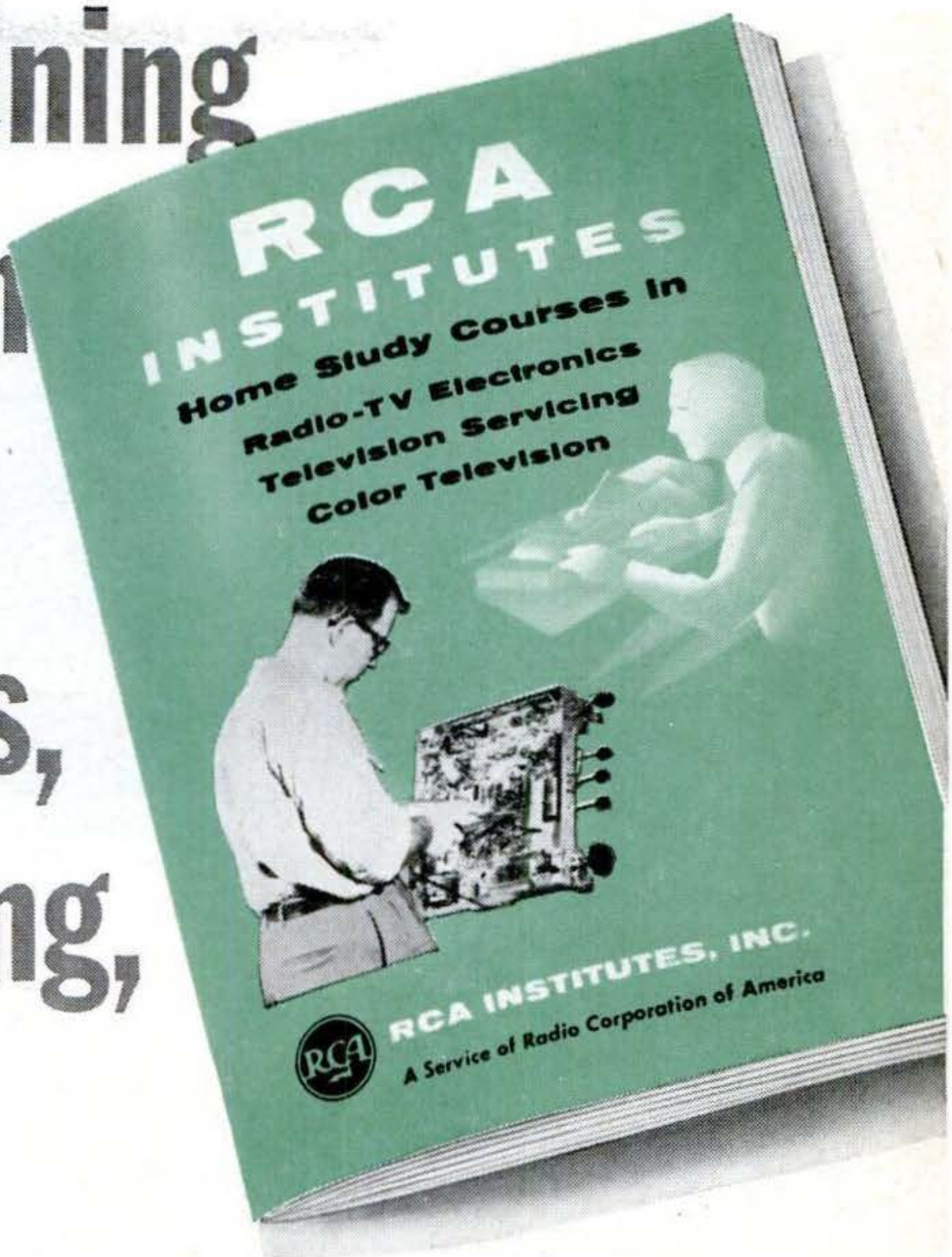

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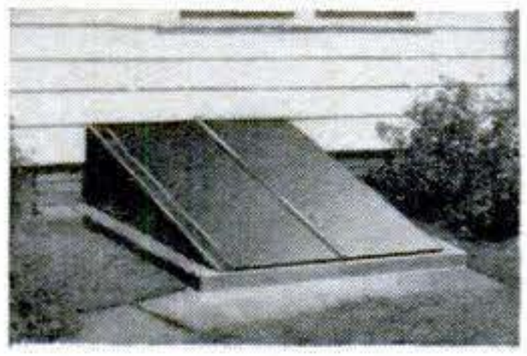

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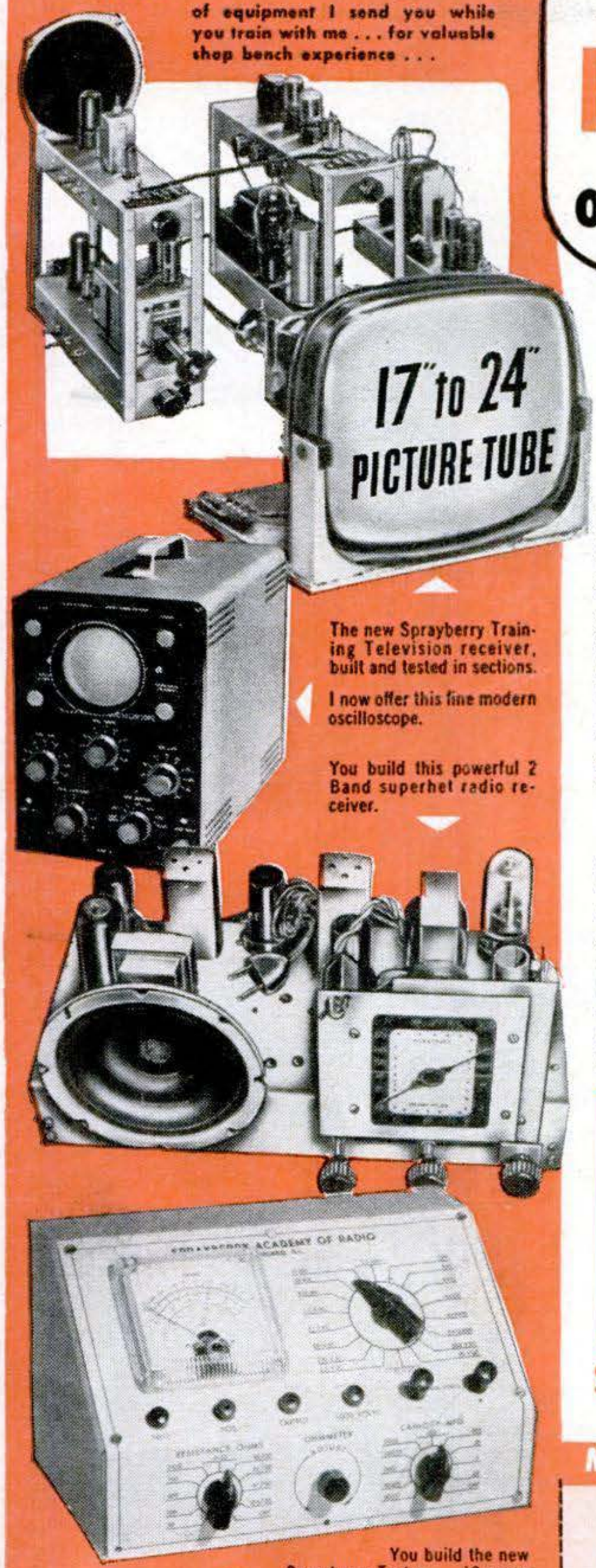

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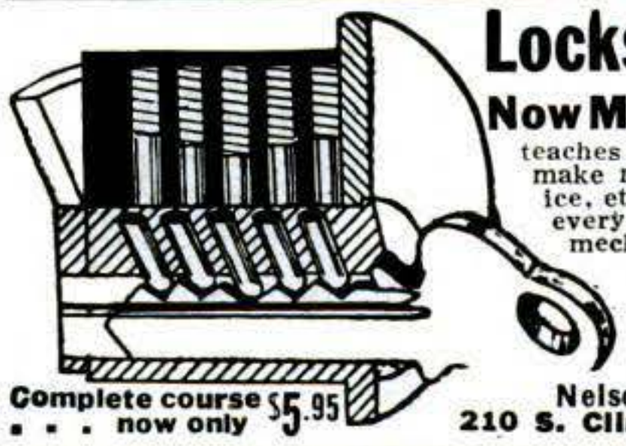

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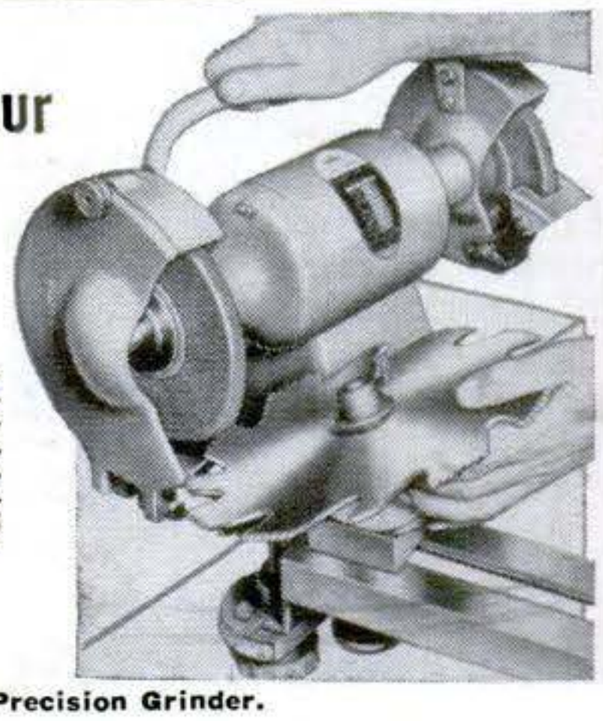

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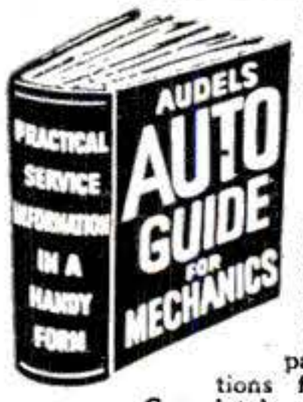

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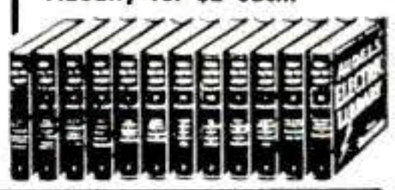

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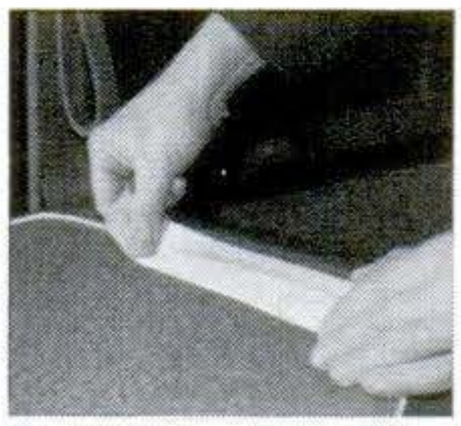

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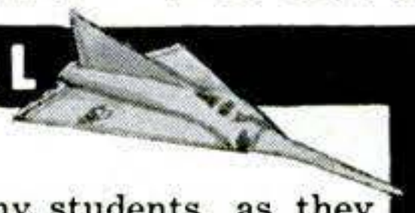

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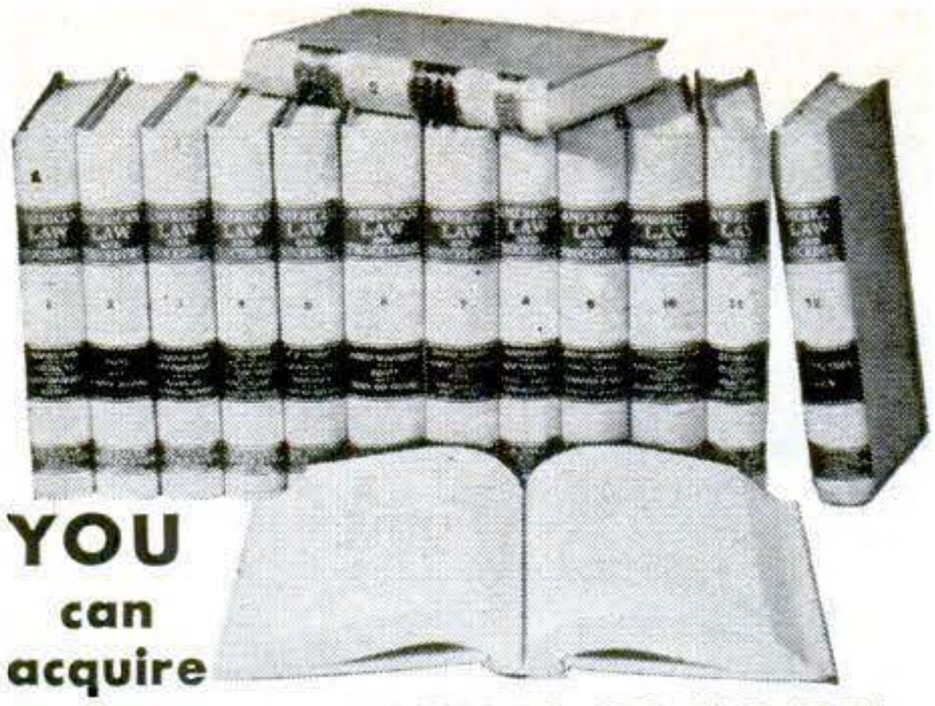

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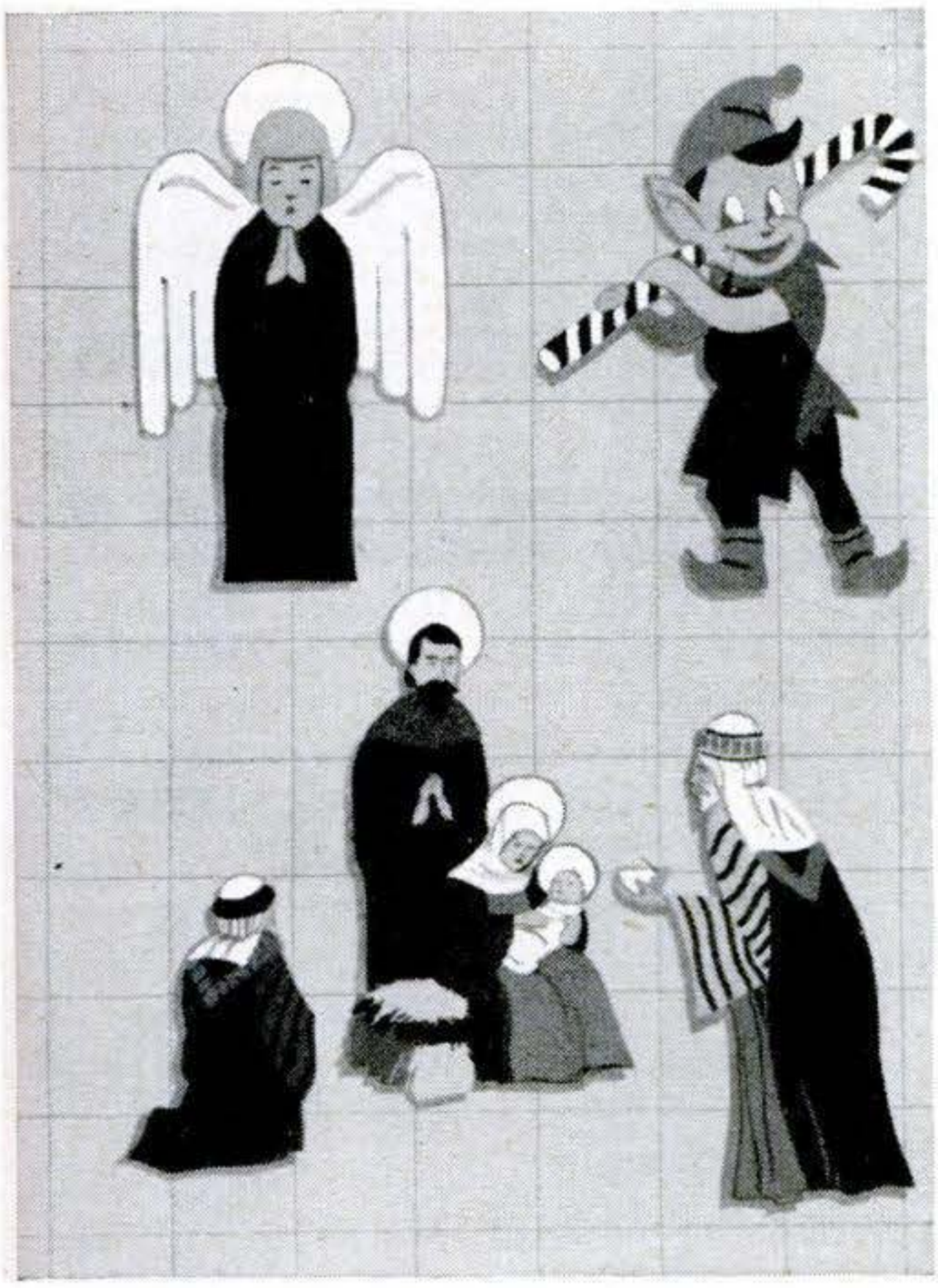

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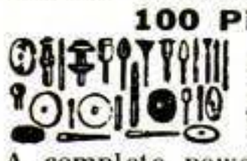

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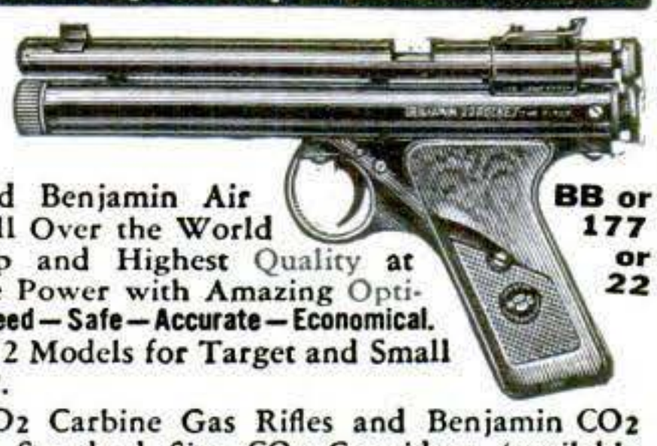

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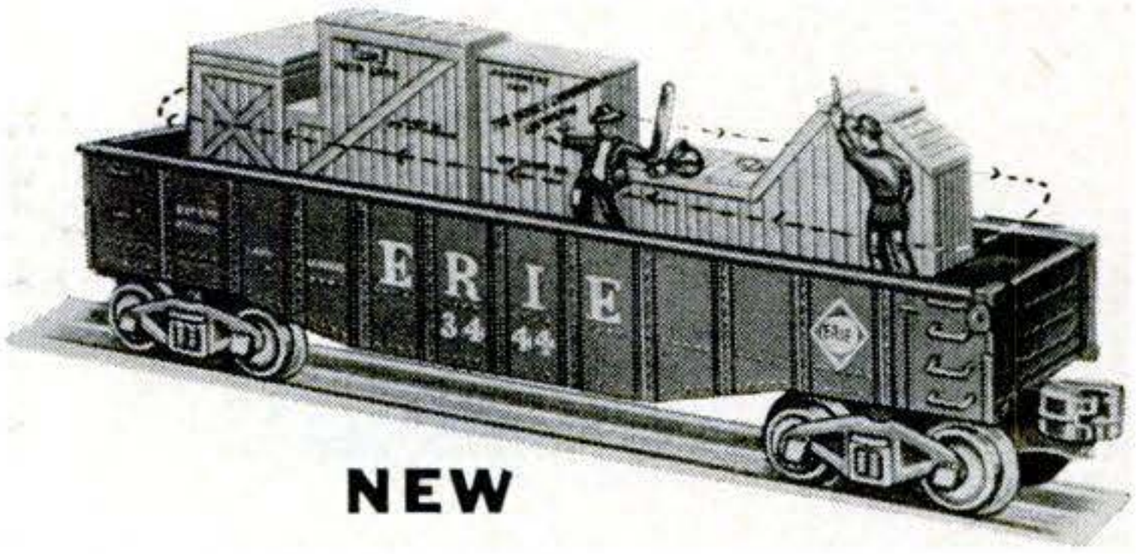

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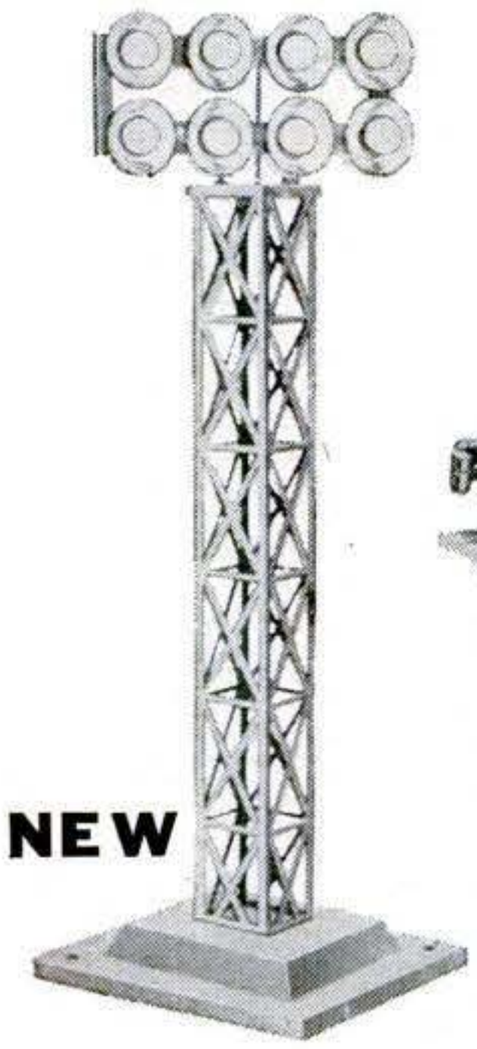

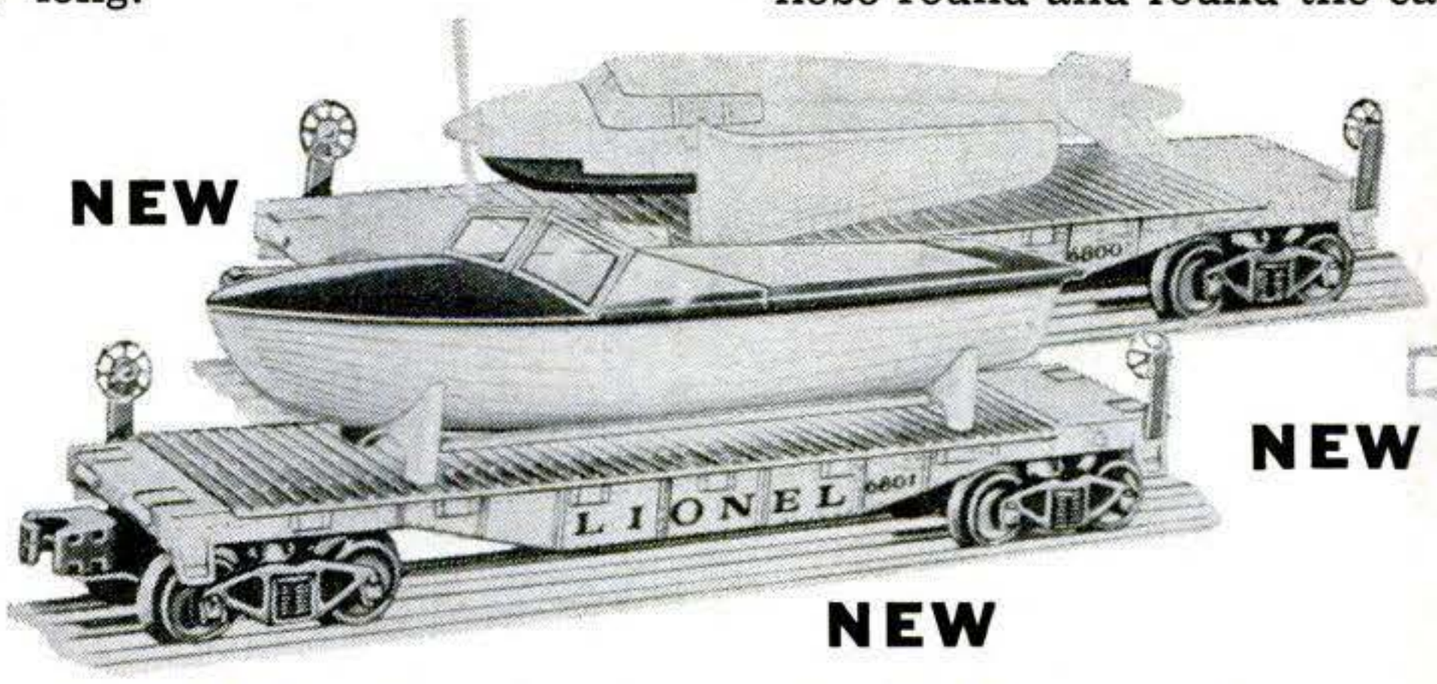

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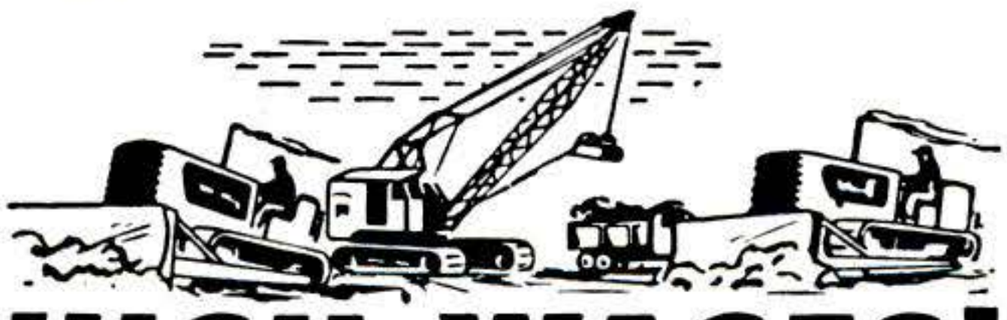

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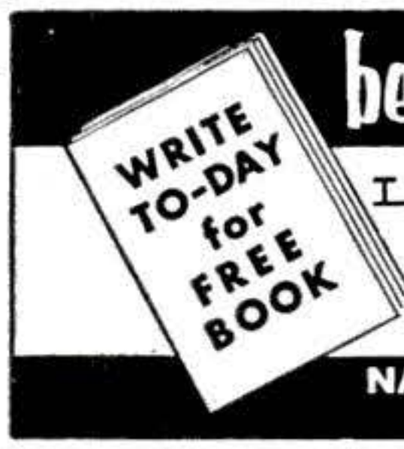

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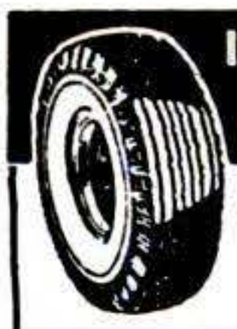

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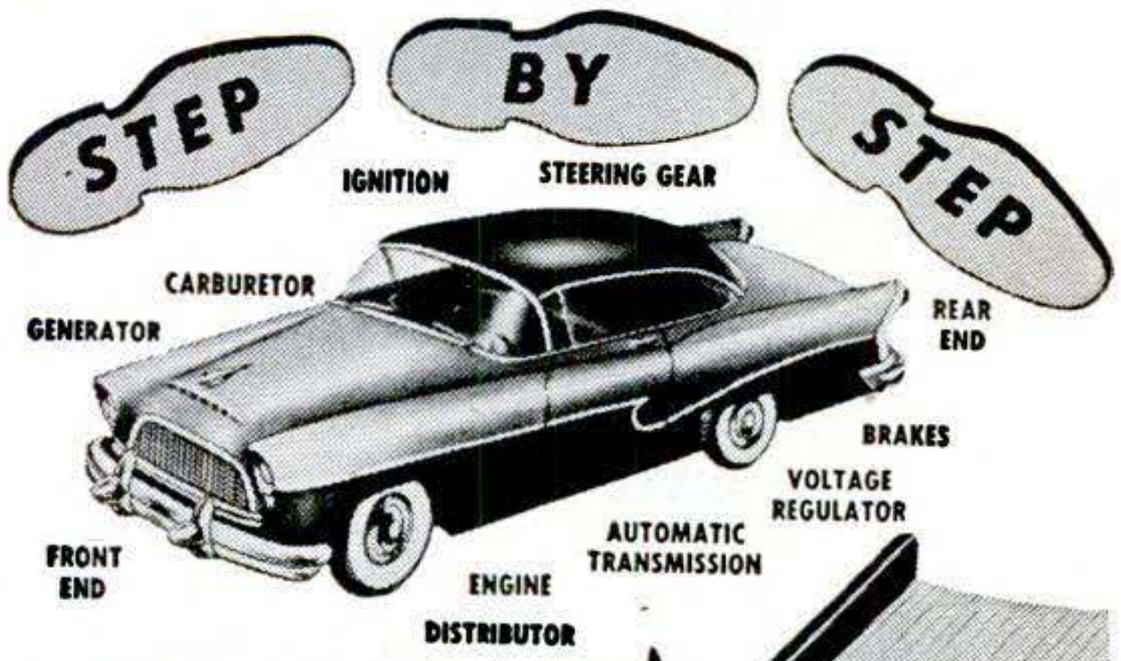

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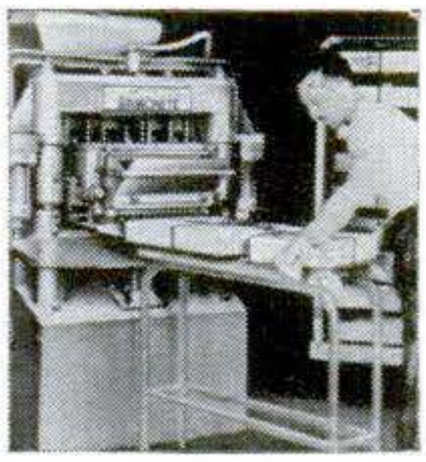

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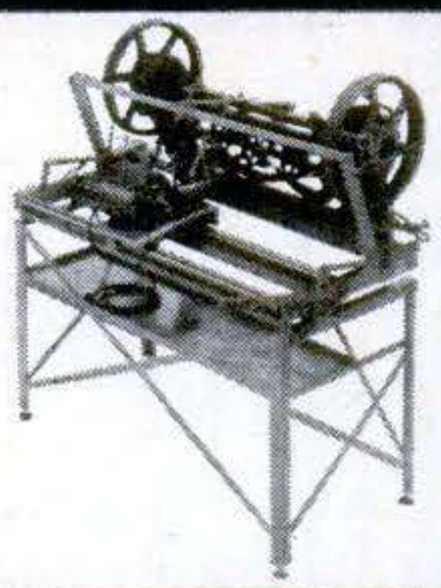

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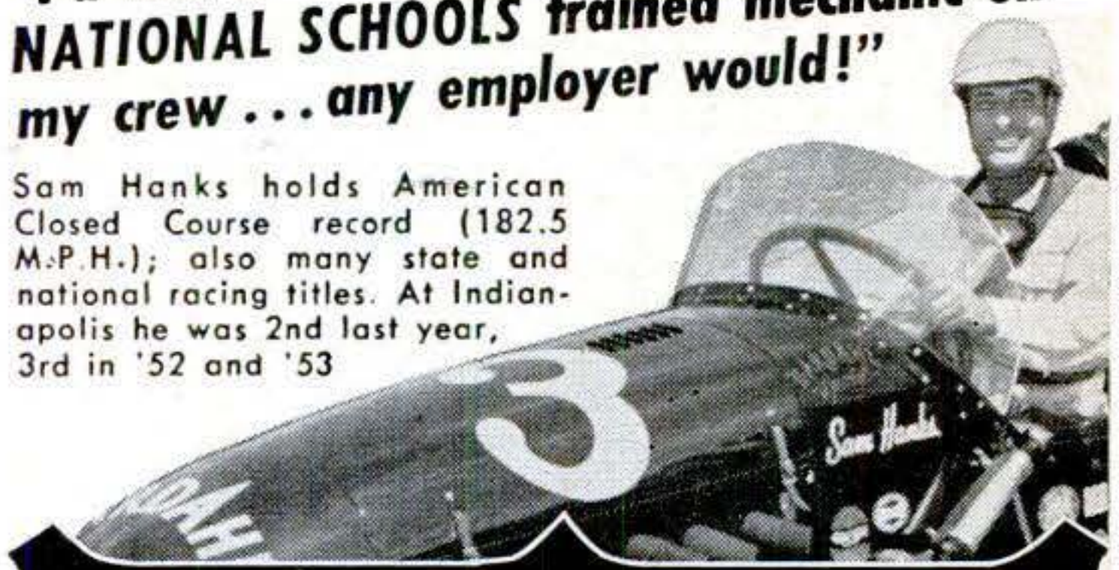

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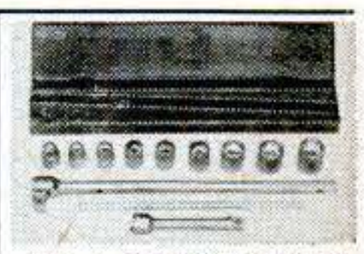

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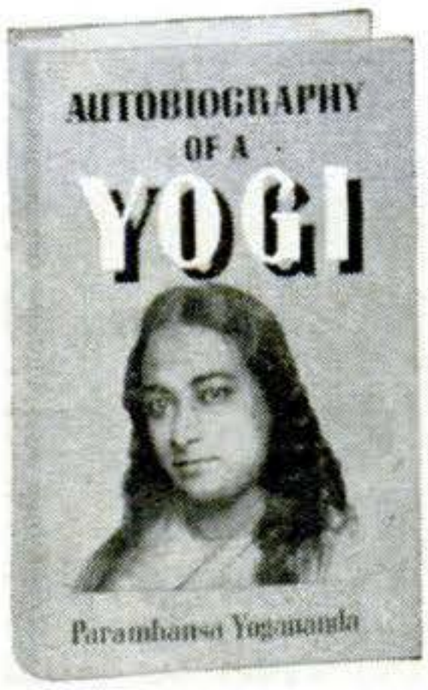

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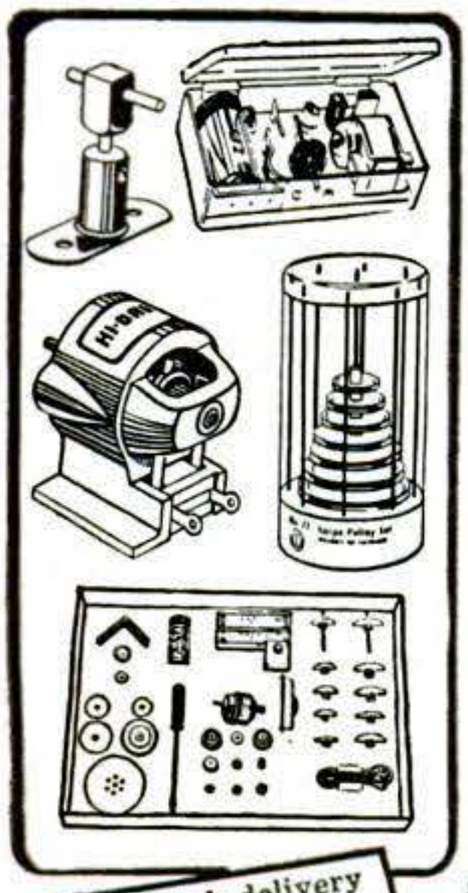

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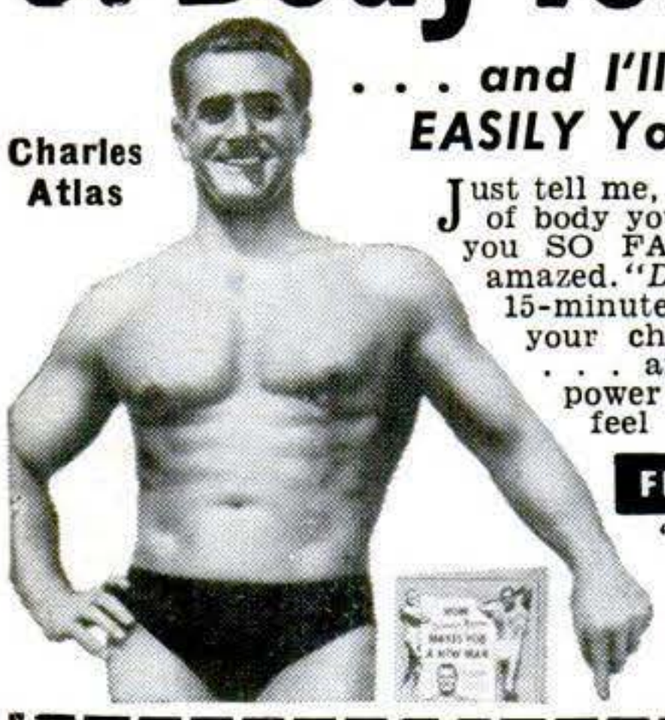

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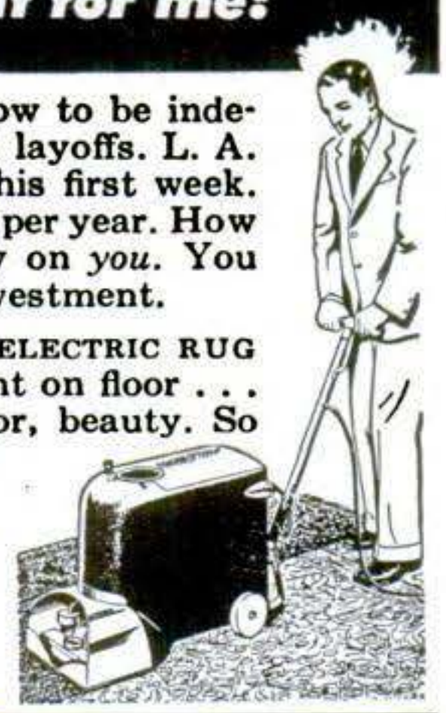

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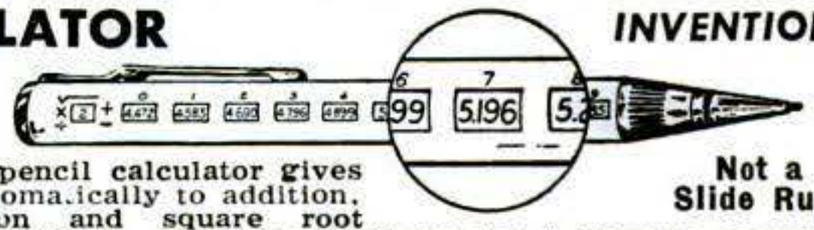

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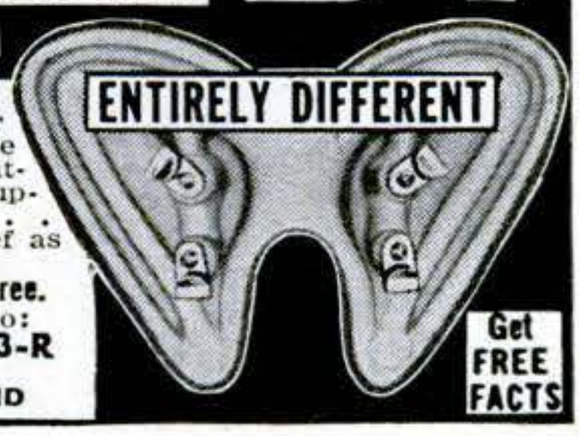

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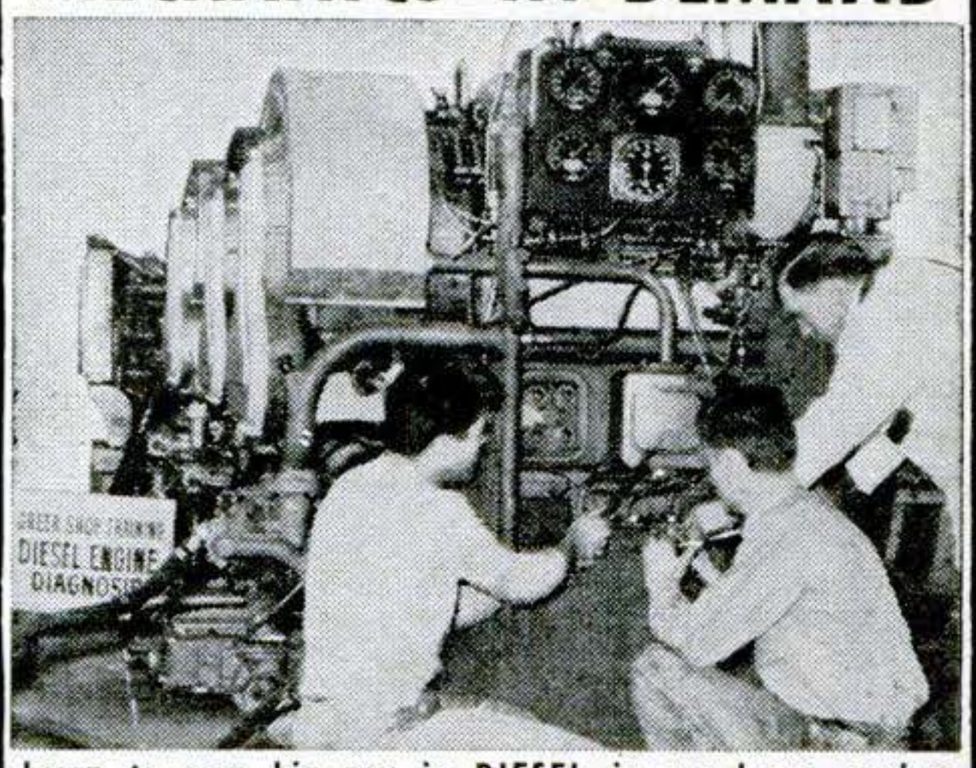

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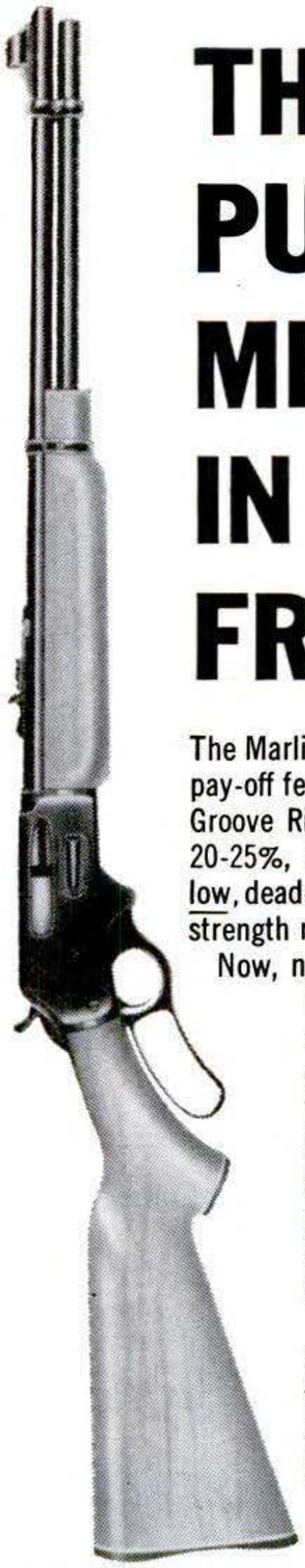

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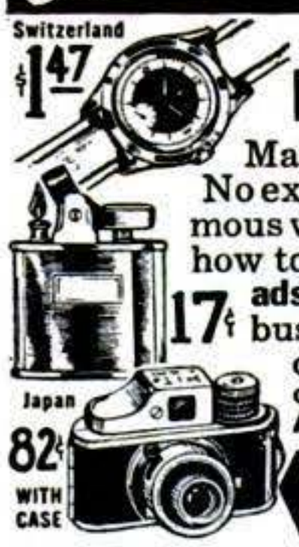

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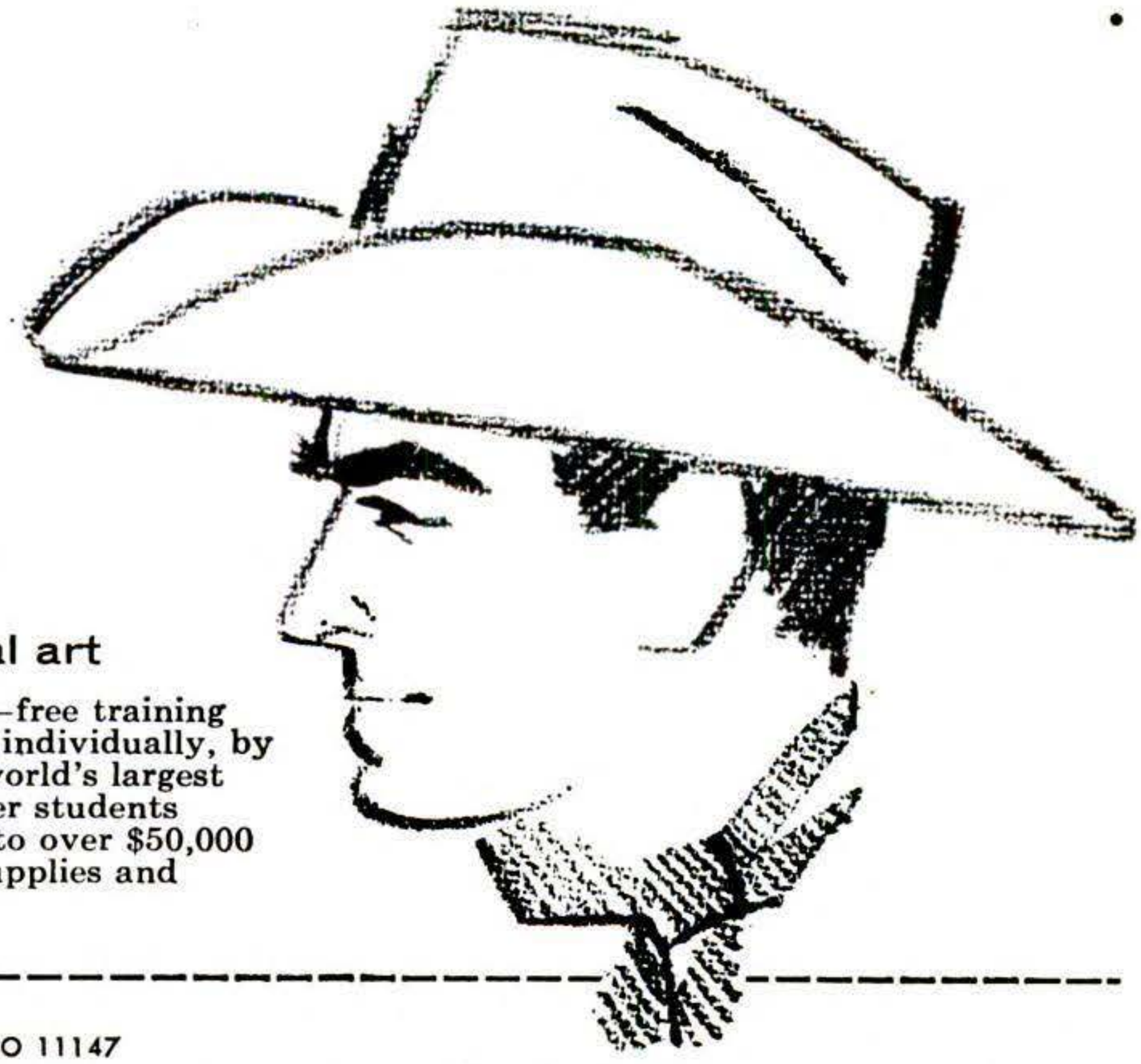

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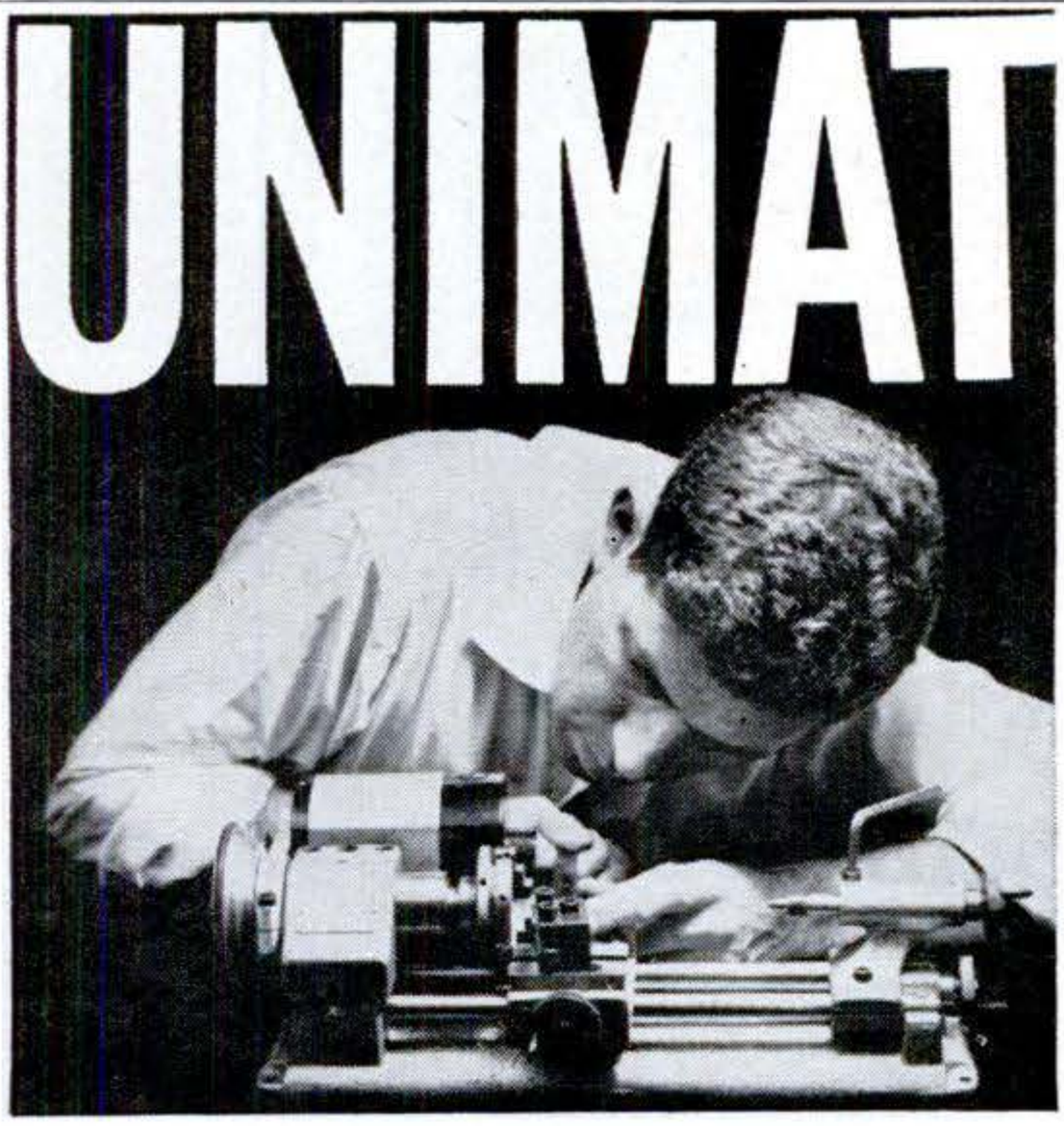

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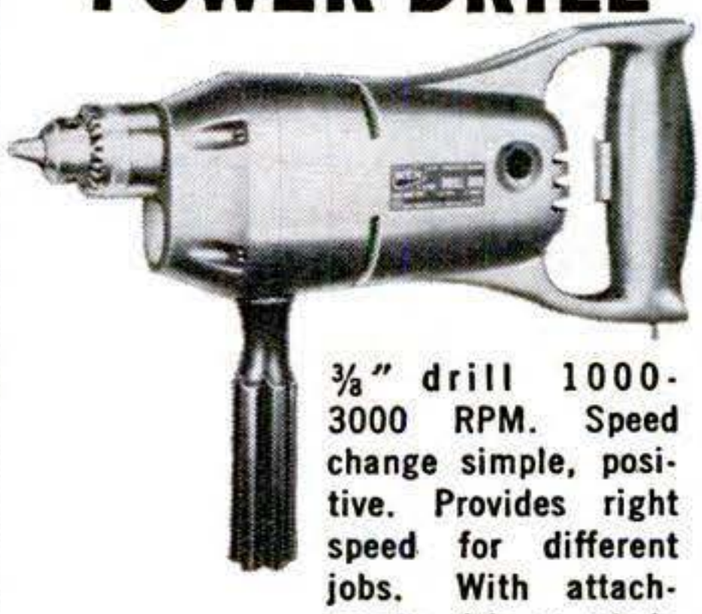

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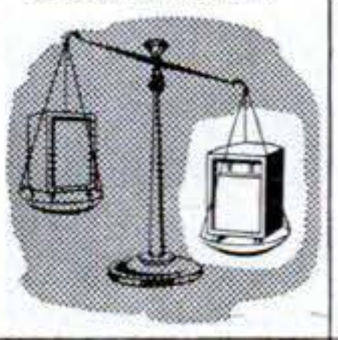

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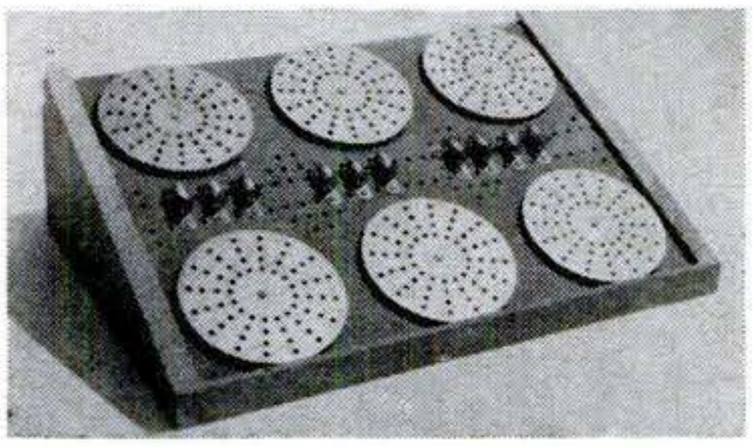

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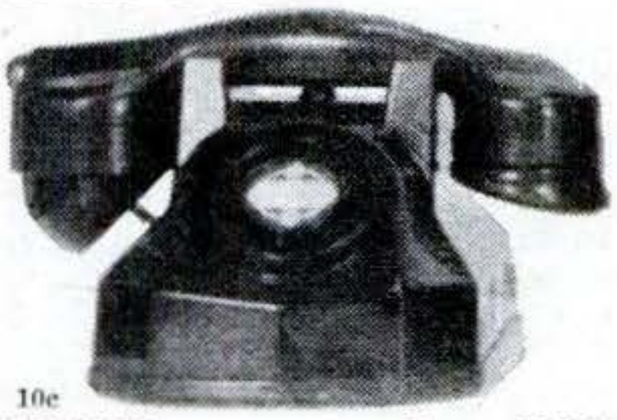

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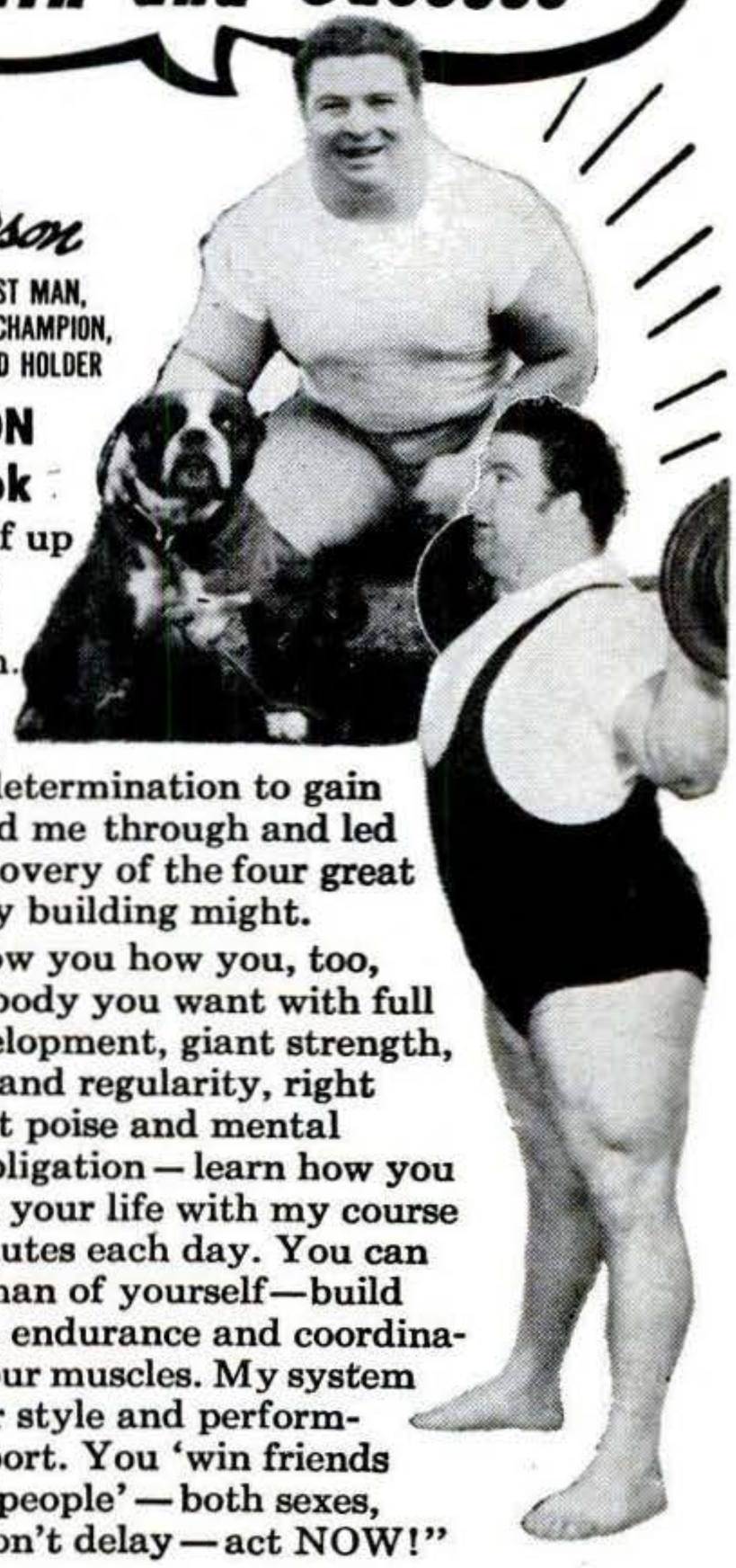

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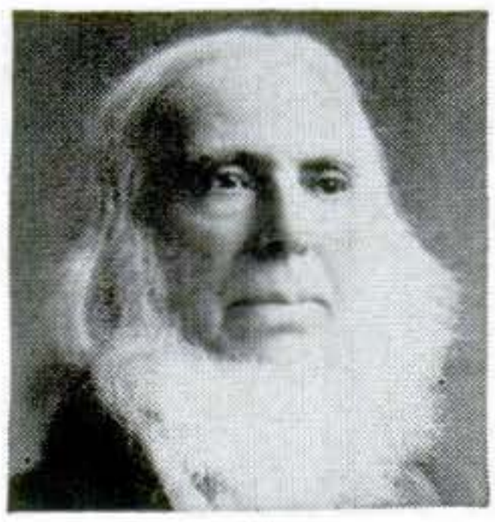

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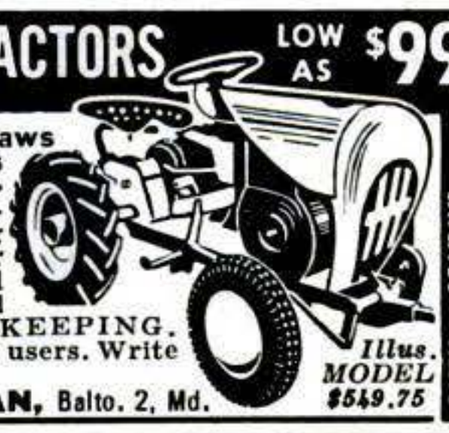

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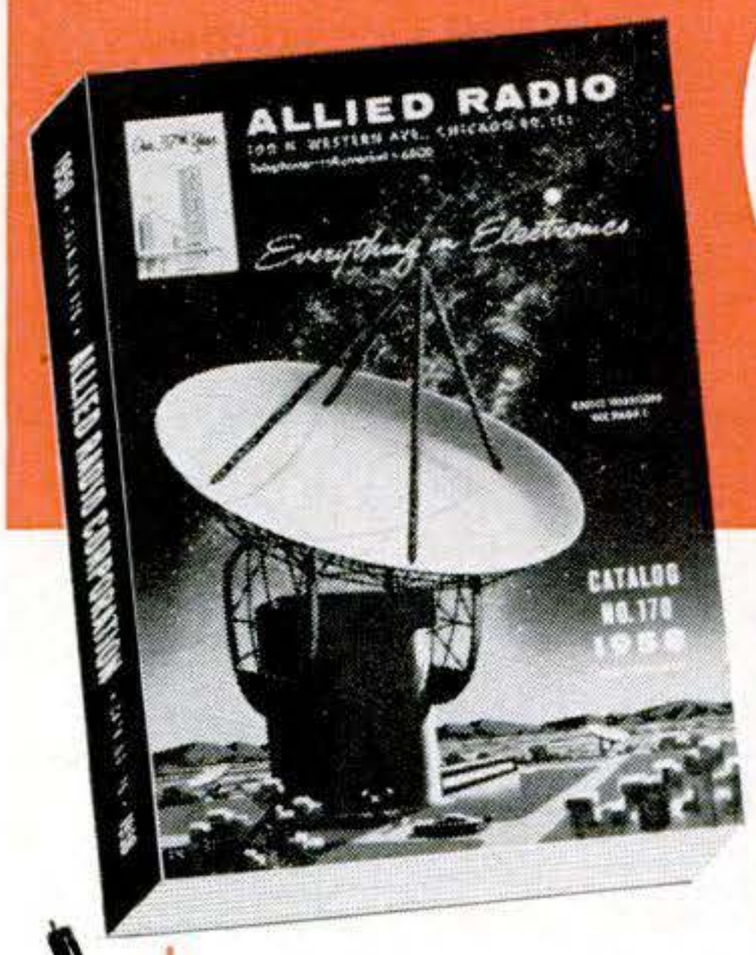

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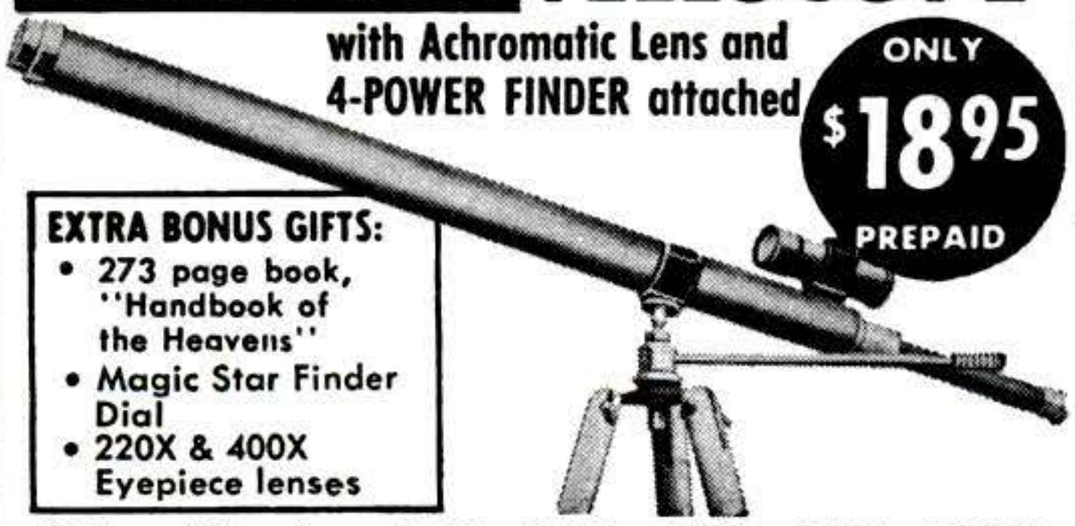

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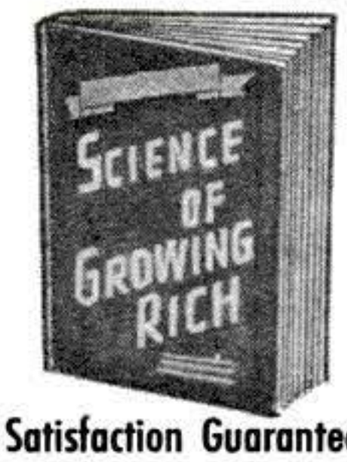

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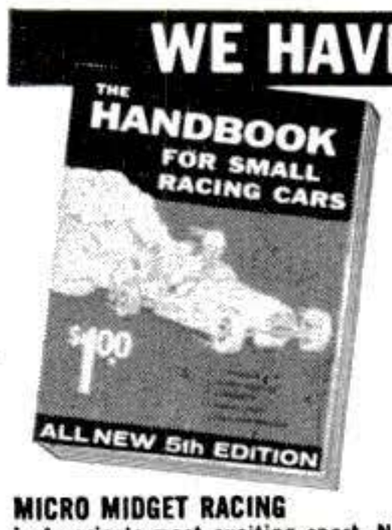

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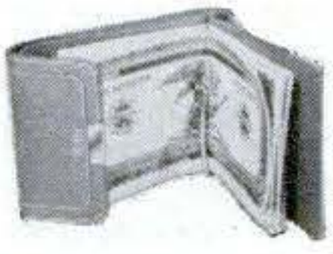

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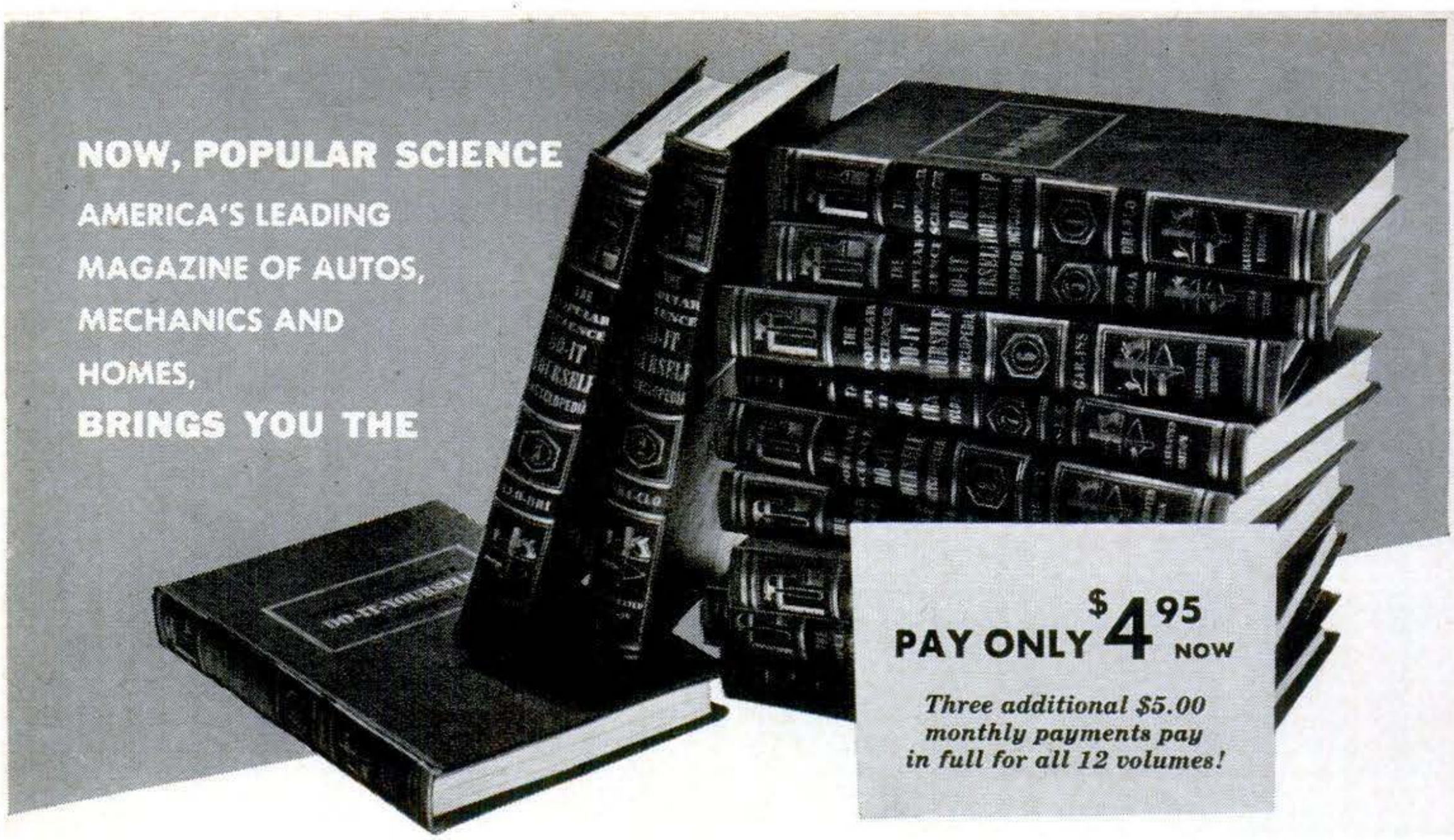

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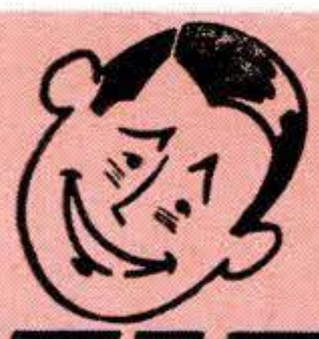

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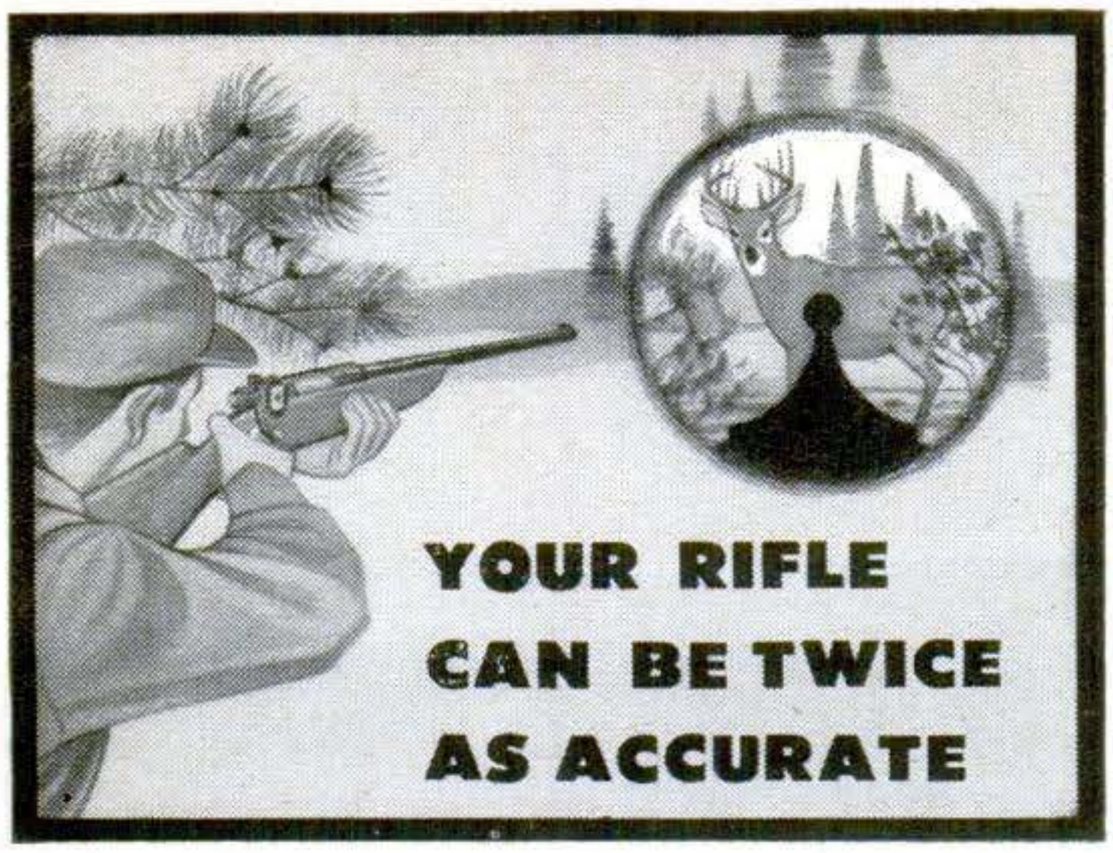

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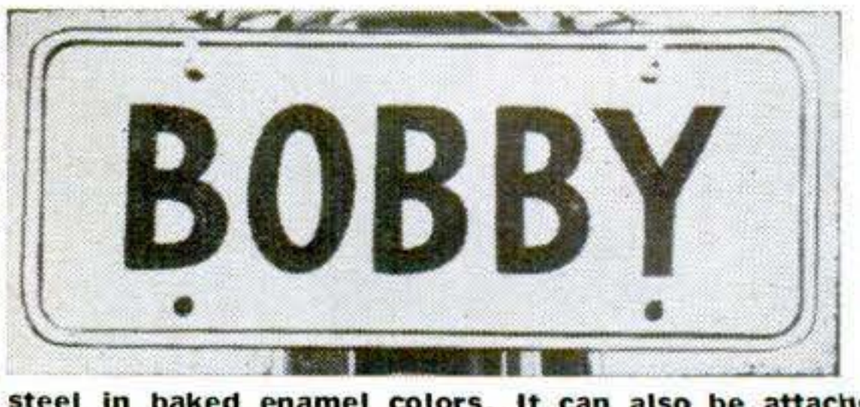

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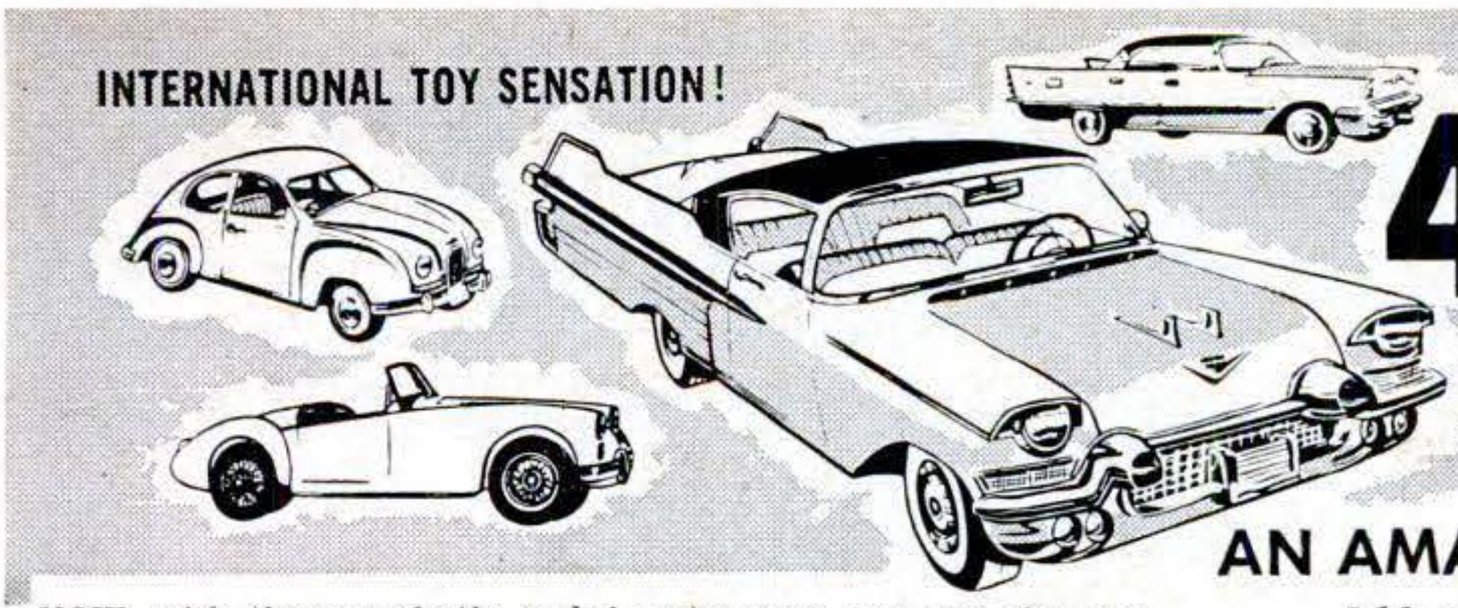

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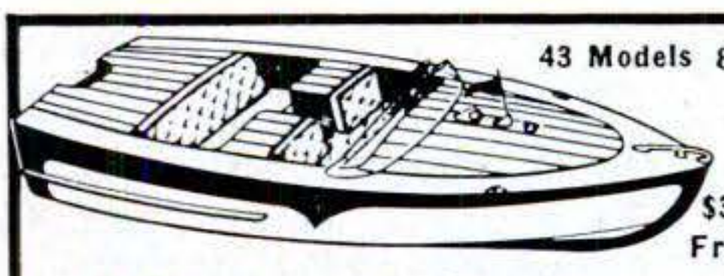

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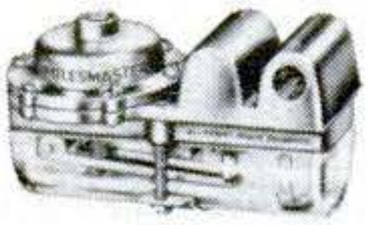

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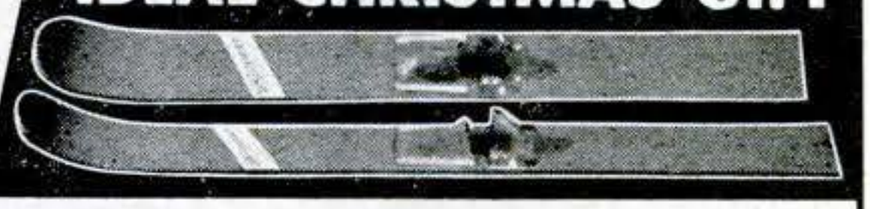

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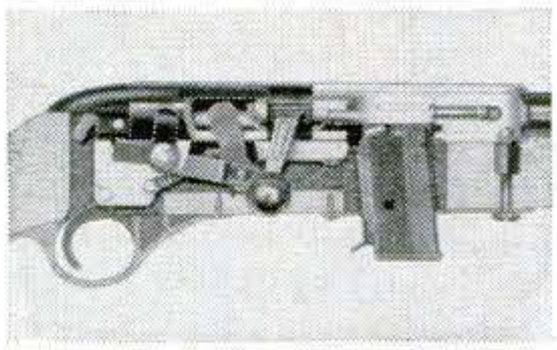

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First clip-type automatic to take all three 22 caliber cartridges—Short, Long and Long Rifle. A convenience thousands of shooters have wanted—another Mossberg exclusive—in this beautiful, inexpensive little carbine. Shoots 7 shots in less than 2 seconds.

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The Bombshell News Behind This Fresh, Bold Look

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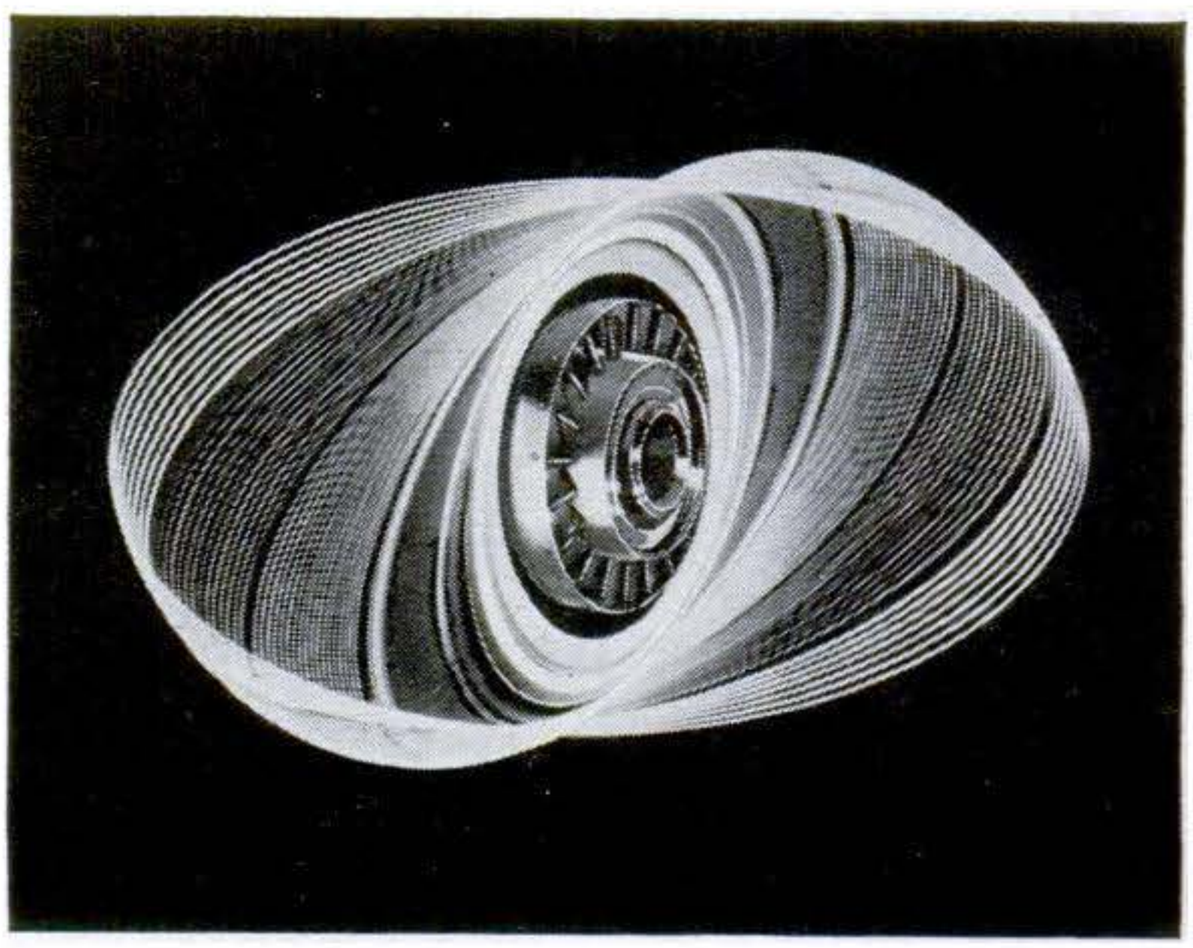

1. Flight Pitch Dynaflow*—Those Buick engineers make transmission headlines again. In the eagerly awaited '58 Buick, they've developed a true *infinitely variable* stator for their triple-turbine Flight Pitch Dynaflow. Now those stator blades in the unit swing not to just two or three fixed positions, but literally to a million or more. That means maximum-power angle for starting, if you want it; gradually decreasing angle as your pace increases; and instant response at *any* pace in perfect ratio for the need at hand. The stator's 20 blades throw oil at the pump at 30 gallons per second at high angle. And this oil, moving at a velocity of 180 miles-per-hour, impinges on the turbine blades with a *constant force of 1,140 pounds*. The performance is spectacular.

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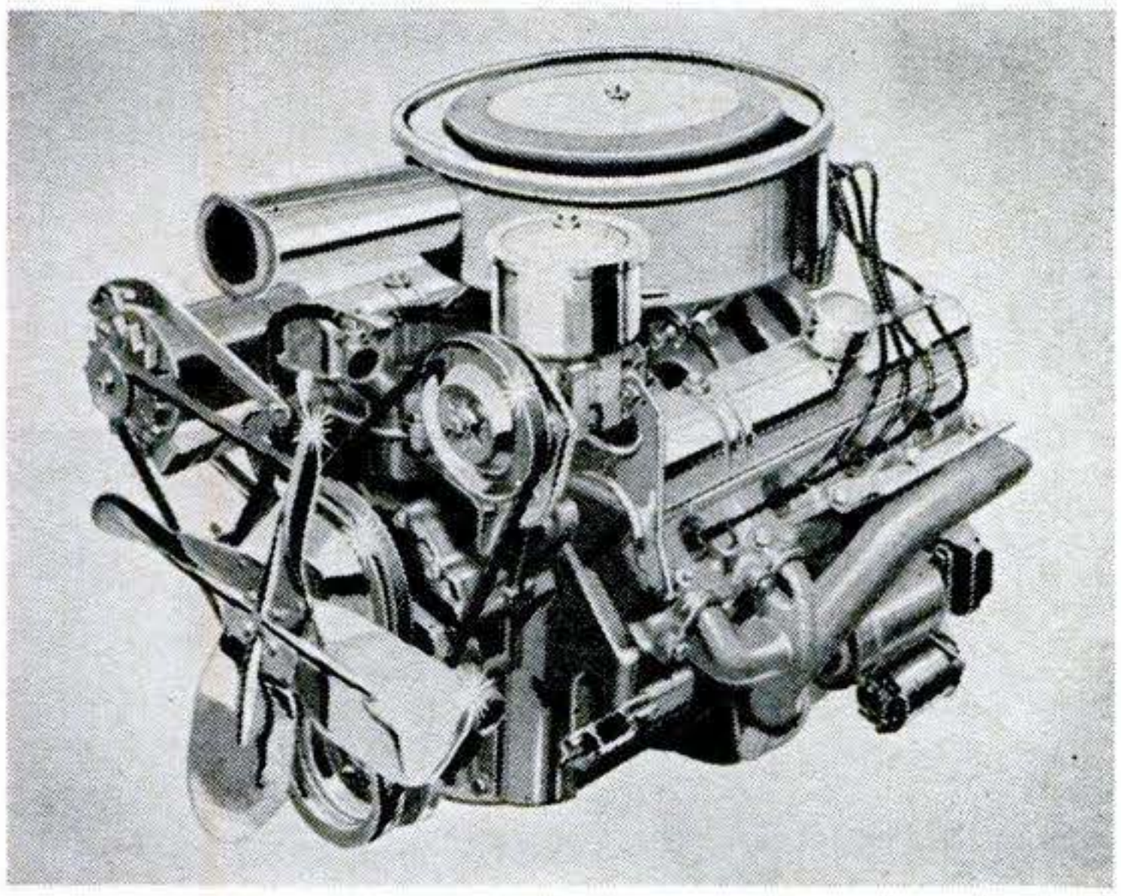
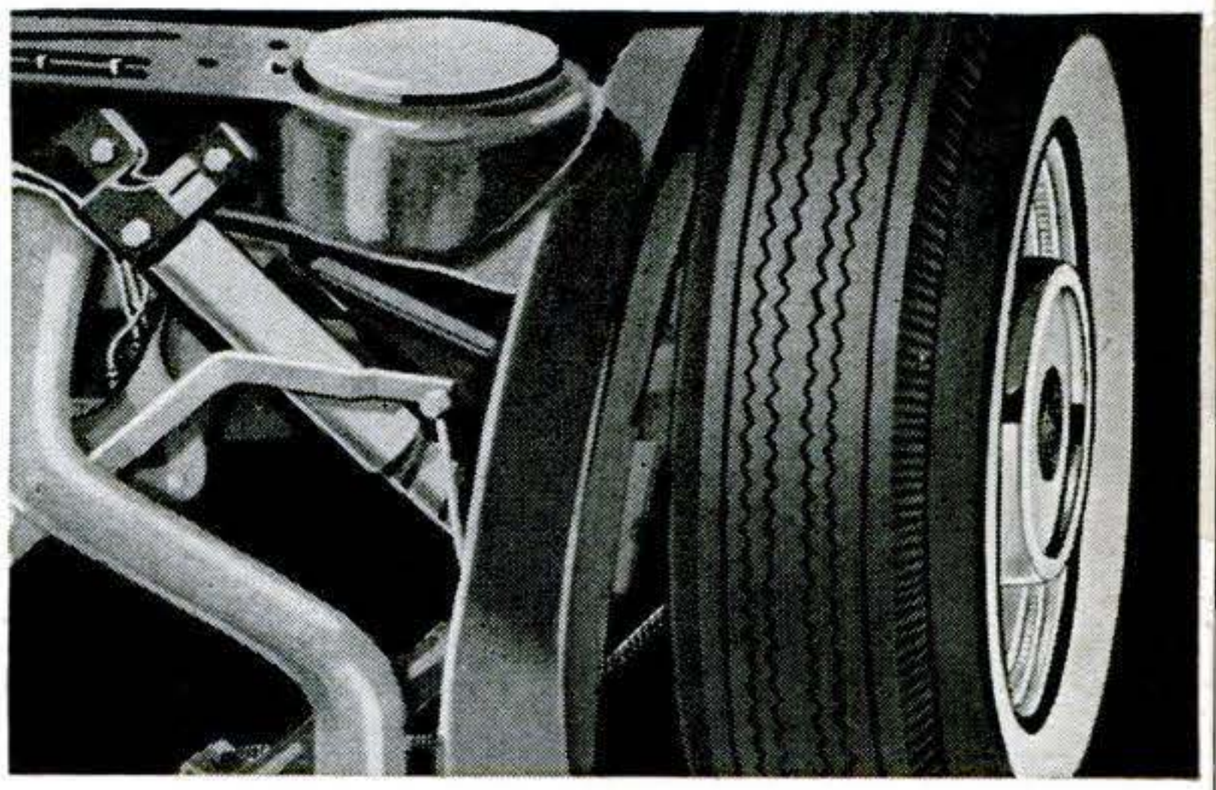
2. The B-12000 Engine—When you talk about engine efficiency, this is the one—the most modern engine it is possible to build for today's fuels. Vertical-valved for extra compactness (world's only vertical-valve V8), this great engine works at a neat 10 to 1 compression, develops *a thrust of 12,000 pounds behind every piston's power stroke.* That translates into superbly brilliant



response. A unique center-of-percussion theory is used with "tuned" nodal-point mounting for more controlled rotational motion of the engine, and for increased lateral stability. With the response of this powerful engine, and the instant flexibility of Flight Pitch Dynaflow, you get in this '58 Buick the first big car that's really light on its feet—most nimble Buick ever.

3. The Miracle Ride plus *Buick Air-Poise Suspension.** Long years of constantly progressive ride-engineering have brought to a peak today the advantages of Buick's ride basics: X-member frame, full-length torque tube, and coil springs at all four wheels. In the '58 Buick chassis, you get a total of 46 feet of spring steel for torsional absorbence of road shock, which cuts vibrational frequency to a low of 65 cycles per minute at the front, and to only 58 cycles at the rear. As an option, Buick Air-Poise Suspension replaces the coil springs, works new wonders for the Miracle Ride. To the basic solidity and stability of the Buick chassis—and without any major changes in its design—it adds 4 columns of compressed air with a *variable spring rate.* This keeps the car at one level, automatically, regardless of load or road condition. There's no other ride like it.

4. Many Significant Changes are found throughout the new B-58 Buick, since a great many projects long under development suddenly came to full flower this year, in this car: the Dynastar Grille, the clean, fresh styling, the "velvet wall" sound silencing, the new Quadrajet Carburetor, the Air-Cooled Aluminum Brakes,* and many others. Best thing any knowing car buyer can do is drop in on



his Buick dealer at the first opportunity to take a good long look at these B-58's, then drive one and let it speak for itself.

BUICK *Division of* GENERAL MOTORS

**Flight Pitch Dynaflow standard on Limited and Roadmaster 75, optional at extra cost on other Series. Air-Poise Suspension optional at extra cost on all Series. Aluminum Brakes standard on all Series except Special.*

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The Air Born B-58 Buick

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Why Air Filters Must Be Changed

Revolutionary new FRAM Air Filter reduces engine wear as much as 90% . . . but, must be properly serviced!

Air can be your engine's worst enemy! Here's why. For every gallon of gasoline your engine burns, it gulps 9,000 gallons of air—air that comes from outside the car—laden with dust, dirt and other abrasives. If these abrasives were allowed to enter your engine you'd quickly have an expensive repair bill!

Now, an air filter has been developed that gives car owners almost perfect engine protection against these abrasives. This is the new *Filtronic* type carburetor air filter. More than half of all '57 and '58 cars are equipped at the factory with this type.

And most of these cars are equipped with FRAM *Filtronic*® Carburetor Air Filters which have an amazingly high efficiency of 99%+ throughout their long life. Unlike other filters of this type the FRAM *Filtronic* Air Filter absolutely prevents the by-passing of dirty air due to the exclusive FRAM patented, built-in gasket.

As a result of this very high efficiency, *Filtronic* type air filter cartridges trap and hold more dirt and dust than old style filters. This means they must be serviced and replaced regularly.

So, for a smooth-running engine that keeps the power you paid for, follow your car manufacturer's recommendation: have your air filter serviced regularly; replace it at least once a year.

AND, REMEMBER TOO, A CLEAN OIL FILTER keeps dirt and sludge out of your engine. For best performance, be sure to change *both* your oil and air filters regularly. Be sure to insist on FRAM—the filter chosen as original equipment by more car manufacturers than any other brand!

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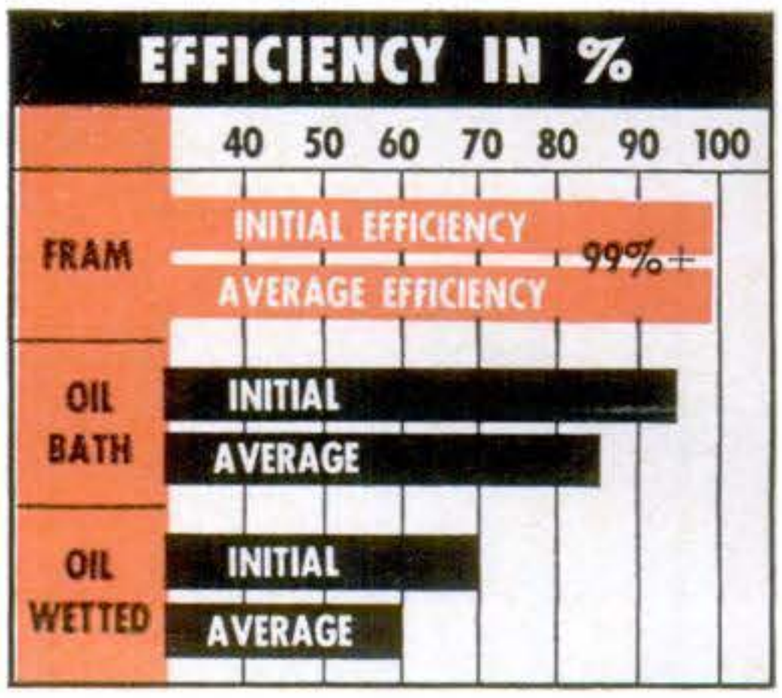
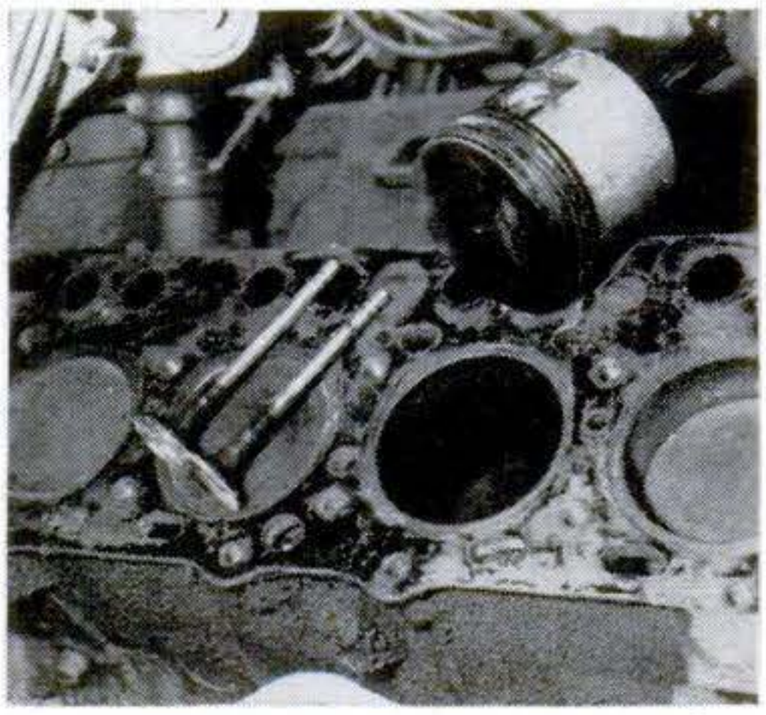


The highest filtering efficiency—initially and throughout long life: FRAM *Filtronic* Carburetor Air Filter.



You expose your engine to this kind of damage when you neglect your carburetor air filter.

Here's the air filter that reduces engine wear up to 90%! Always insist on genuine FRAM *Filtronic* Carburetor Air Filters.

Remember—

FRAM Filters best!

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POPULAR SCIENCE
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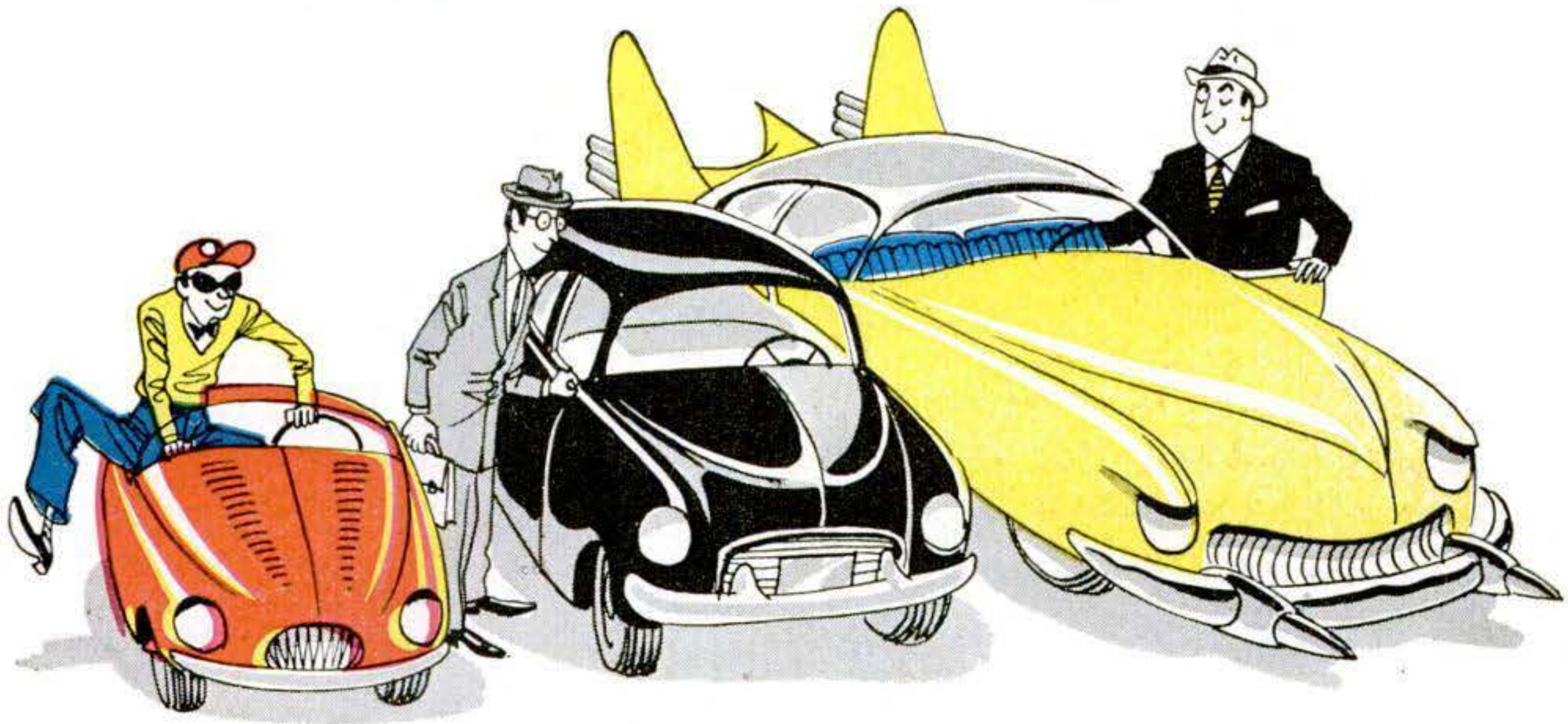
The Hidden Reasons Why You Buy a Car



The kind of automobile you drive tells researchers secrets about you that you'd never admit. Now Detroit is using this knowledge to influence your choice among the new models

By Guy Shipler Jr.

THAT new car you drive around so proudly is betraying your innermost secrets.

Whether you know it or not, you laid bare your hidden desires and ambitions the minute you drove away from the dealer. For, unless you are different from most people, your car shows—more clearly than your home, your neighborhood or the clothes you wear—just what kind of person you really are.

The science that spills the beans about you is called motivation research. It's done not by guesswork, but by painstaking and probing inquiries—sometimes so framed that the persons questioned don't realize how much they are telling.

Your car, the researchers have found, tells what you want to be or what you think you are. It probably reveals more of you to friends and neighbors than you would yourself after a few highballs in their living room.

You don't believe, of course, that your new car shows your hand this way. After all, you carefully explained that you had to get it because your old one needed a valve job, or the bearings were shot. You hated to spend all that money, but it was just sound economy.

Most neighbors will buy this, even if they don't believe it, because they'll be telling you the same story as soon as they decide that their own bearings have worn out. (They may reach this decision earlier as a result of your purchase.)

The foregoing is the embarrassing truth that the auto makers have learned about you and me as their customers. They spend millions of dollars a year probing for the real reason we buy their cars (or somebody else's). They turn up findings —through deep and thorough consumer analyses—that would make the most self-sufficient person blush.

And the main finding is this: We seldom buy new cars any more because we really need them. We buy them because

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they have become a symbol of our social and material status.

The "personality" of the new Edsel was created deliberately to appeal to "the young executive or professional family on the way up"—after exhaustive research turned up evidence that this group offered the best potential market for a new entry in the competition for the car buyer's dollar.

Most of us take more pride in a new car than we would in being President

"The automobile is such a strong instrument of self-expression," says one company that has done deep motivation research for the auto makers, "that it has replaced house, home and motherhood as a gauge of security and success. Most Americans take more pride in owning a new car than they would in being President of the United States."

Thus the auto makers know that deep emotional and personality factors play a far bigger part in our decision to buy a car than the practical reasons we give.

That's a big change. Not too long ago, a car was simply transportation. A bit later it became a necessity. Even though these things are now even more true, they have become secondary to a car's value as a measure of the family's place in the community.

We would never admit that we buy a car for frivolous reasons. Our prestige is based on appearing logical and mature.

But recently one of the Big Three auto makers trapped a sampling of car owners into revealing their real motivations. When asked to mark on a checklist the most important things they would look for themselves in buying a car, the vast majority headed the list with economy (gas mileage), dependability, roominess, brakes. At the bottom stood such things as outside looks and engine power.

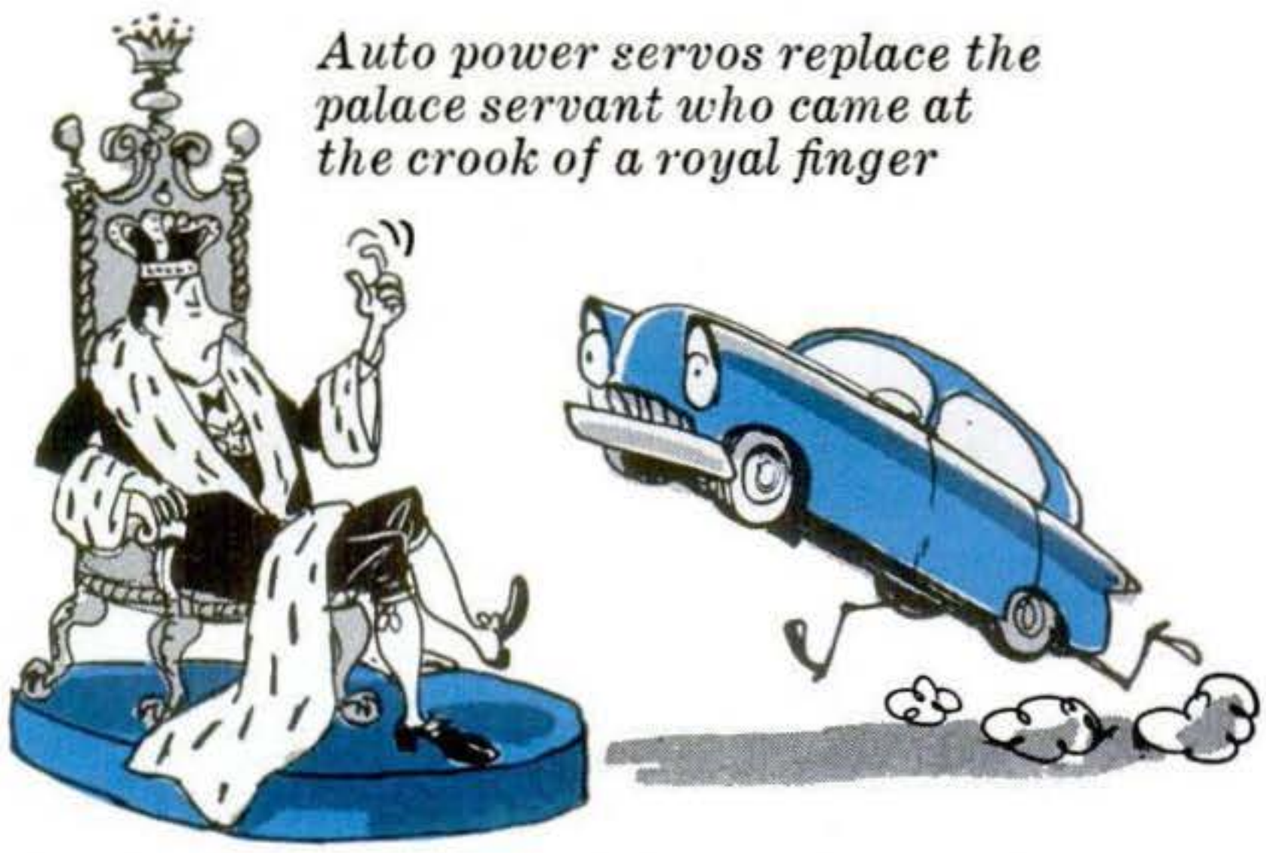
Then the company sprang the trap: "Now what do you think your friends would consider most important?" it asked.

Sure enough, the list was completely reversed. Outside appearance stood at the top, and power ran a close second.

In other words, we attribute to our neighbors our own secret desires. No matter how stoutly we deny it, we have told the auto makers that they will sell us more cars by emphasizing styling and power rather than economy and brakes.

We have also told them that we will buy most of the fancy gadgets and accessories they make. (Note how power steering and power brakes have caught on, in spite of initial wariness.) Says one spokesman for an auto maker: "I'll swear that if we could make the car run by lifting a little finger—and proved it would work—the public would leap at it.

"Why? Because it gives a sense of power and prestige, a sense of controlling something. For the average guy, the modern servo-mechanism is a substitute for the palace servant who comes at the crook of a royal finger."



Auto power servos replace the palace servant who came at the crook of a royal finger

Because of this strong prestige factor, we don't hesitate to buy optional equipment, in spite of extra cost. "In fact," says one car company, "some new gadget might make a man decide to buy a particular car, especially if it will mean only a few dollars extra a month."

Essentially, this is because total price means little in our final decision these days. We ask ourselves only: "Can I meet the monthly payments?" We almost always convince ourselves that we can.

Why are we so intense about a new car? Simply because more than anything else in our society an automobile crystal-

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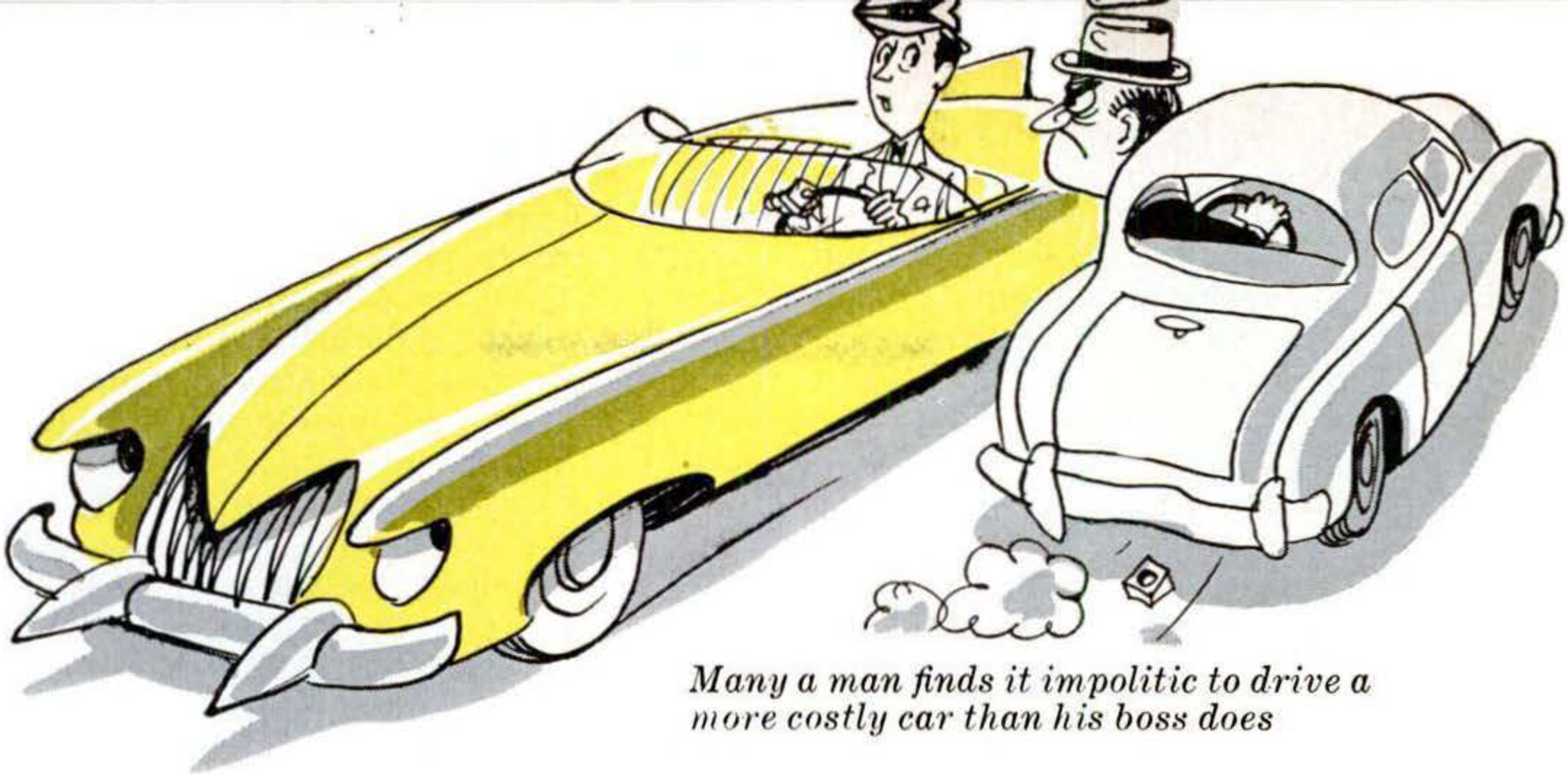

Many a man finds it impolitic to drive a more costly car than his boss does

lizes our dream of being somebody—just as a fine horse would have 50 years ago. The social code is far more stringent in other areas—for example, not everybody can live in whichever neighborhood he chooses, nor join the club he wishes.

But any man can own any car he wants without being ostracized: The Cadillac doesn't seem too much more out of place in the carport of a development house than it does on the sweeping bluestone curve of an estate driveway.

On the other hand, a sensitive man knows that it isn't always politic to buy a car above and beyond his economic and social status. Many a man in a new job has spotted his boss driving a less expensive car than he was—and corrected this *faux pas* by trading the buggy for one in the boss' price class.

No matter whether you just bought a Ford, a Cadillac, or something in between, you will almost certainly be that car's greatest booster. The surveys show that the new car owner is the most careful reader of the advertisements for that car—he hates to feel that anything can be criticized about it, and is constantly looking for proof of the wisdom of his choice.

He will stick with his car make for years on end; his sense of loyalty resembles the old-school-tie enthusiasm of a college alumnus on a reunion weekend.

One thing that can make him switch brands—and it gives car makers nightmares—is buying a new car that turns out a lemon. The average man takes this as a personal affront, a betrayal of years of devotion and loyalty. He then becomes that brand's worst enemy. "The only thing that would shock him more," said one manufacturer, "would be to have his best friend run off with his wife."

More than anything else, it's this brand loyalty that trips up car makers' efforts to draw customers from their competitors.

People won't change overnight from one car make to another the way they change cigarette brands. It takes time to persuade them that a different car more nearly fits their personality.

Yet there's plenty of survey evidence which shows an almost direct relationship between four general personality types and the cars they buy:

Conservative. He likes dependability, trade-in value, rather than appearance or power. He'll take a four-door over a hard-top, a hard-top over a convertible.

Moderate. Likes a car that's popular; he wants to be in the swim. Goes for a combination of appearance and performance, likes new styling rather than modification of old, will buy current gadgets.

Sophisticate. Prefers something different, perhaps imported. Will put up with

A new car that's a lemon can make the brand-faithful buyer a bitter enemy

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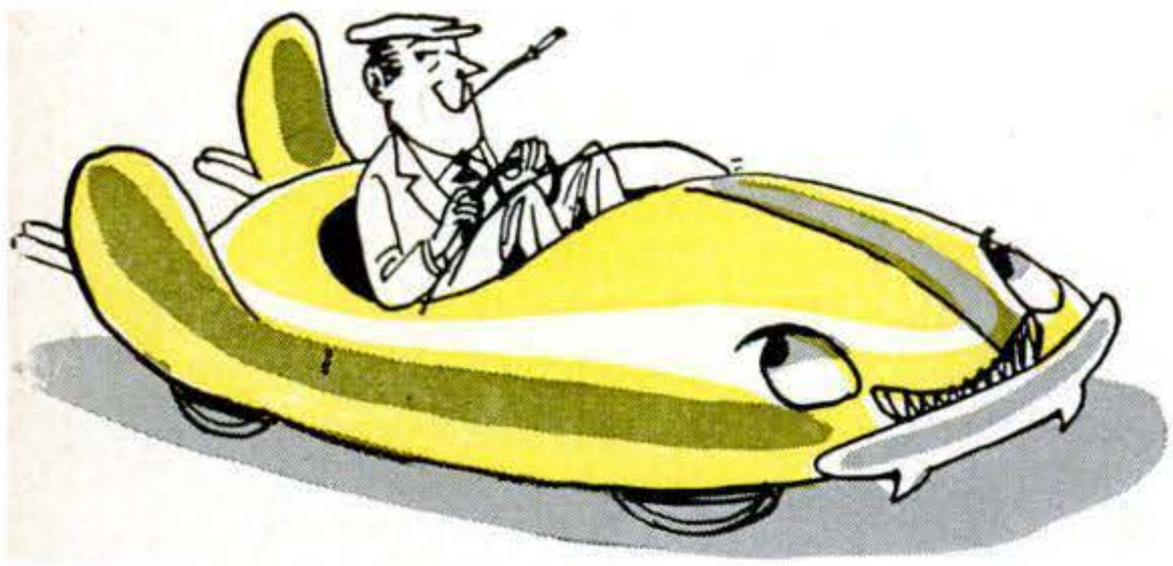
(and deny) many inconveniences for an unusual car.

Extremist. He wants attention, goes for big, costly cars with lots of flash. Will try any innovation, tested or not.

Attitudes toward specific cars may bear little relation to the cars' 1958 reality; instead, they tend to be crystallizations of feelings accumulated over the years. "I buy Gadget 8's," says Papa, pointing to his five-tone, titanium-plated, power-ash-trayed car, "because they're conservative." Well, maybe Gadget 8's were, once.



The sophisticate will put up with discomfort to be different

These generalities can be narrowed down to individual makes and models. The most thorough pinpointing was done by Social Research, Inc., for the *Chicago Tribune* a few years back. Their findings (with updating by other research groups):

Cadillac. Few owners are conservative. Those who are think of fine engineering and performance instead of social status. Newly prosperous and even low-income owners (a growing number) wish for attention. This car gives them the status, in their own minds, which they may not otherwise be able to get.

Lincoln. Not so pronounced a status symbol as Cadillac—and thus preferred by those who feel their status needs less confirmation. Owners think they show interest in power, performance and appearance in a more dignified way.

Imperial. A solid, dependable luxury car whose mechanical features appeal to the conservative in the upper-class car group. New body design last year has attracted moderates (new styling appeal) and extremists (big, costly cars, innovations) away from other high-priced cars.

Chrysler. The upper-class car that moderates like—not too showy, not too conservative. A "family" car which still shows the owner is up-to-date and willing to go along with what's popular. Owners like to stress high power, want wide choice of colors and models, like latest accessories that aren't extreme.

Buick. Also the moderate's family car. Mobile, successful people who want higher social status. Primarily preferred by men, who like its substantial look.

Oldsmobile. Owners like some flashiness; they emphasize appearance, and want to show their individualism. Otherwise, the car is similar to Buick.

Mercury. Appeals to people who combine individuality and responsibility. Owners consider it reliable and utilitarian, but are most fond of its showy appearance.

De Soto. Conservative, middle-aged or retired people like this car—it's a sign of being "settled down," helps express their dignity, reserve, maturity. Like the car, its owners feel dependable, practical. But its appeal is changing with recent flashier styling.

Dodge. Similar feelings toward this as toward the De Soto—except that it appeals to a younger group. Owners tend to talk about low operating cost.

Pontiac. Moderates like this because it is the most moderate of cars. It brings few general criticisms; above all, people consider it a good value.

Ford. Least class-bound car. Liked by people who think of themselves as youthful, quick, high-spirited. Combines a "tasteful showiness" with reputation for speed, durability and high trade-in.

Plymouth. The car the conservative still in the low-priced-three will be most likely to buy. He thinks of it as a sensible car for stable, average people, is impressed by economy. Surveys show Plymouth attitudes to be mildest of all. Restyling may bring attitude changes.

Chevrolet. The moderate in the low-priced-three likes this car. People evaluate Chevy in a more practical, factual tone (they stress universal service facilities, for instance) than they do Ford. A new appeal is to the performance-minded.

Maybe you will violently disagree that your car reveals even this much about you. And maybe you are right, because we are all individuals, and the same values don't apply to everybody in the same way. Just don't look at yourself too closely in the mirror. END

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This month Detroit launches its biggest Battle of the Stylists. Popular Science color cameras previewed the designers' secrets to bring you closeups of 14 new cars in our

Auto Showroom: 1958

Keynote of the new models this year is body styling, which auto makers have found the Open Sesame to car buyers' checkbooks. The battle of the fins continues. Most cars are four-eyed. Grilles are splashy, hoods low, glass area immense. Rear-end ornamentation is even flossier. Colored metal trim is coming in big, while two-tone finishes are rarer.

The engines have a gosh-awful amount of power. Air springs are optional on many makes. There are some changes in brakes and transmissions.

See the next 11 pages for a hot-off-the-line look at the new automobiles. Then turn to the section following the color photos for detailed reports on what's new under the hood.

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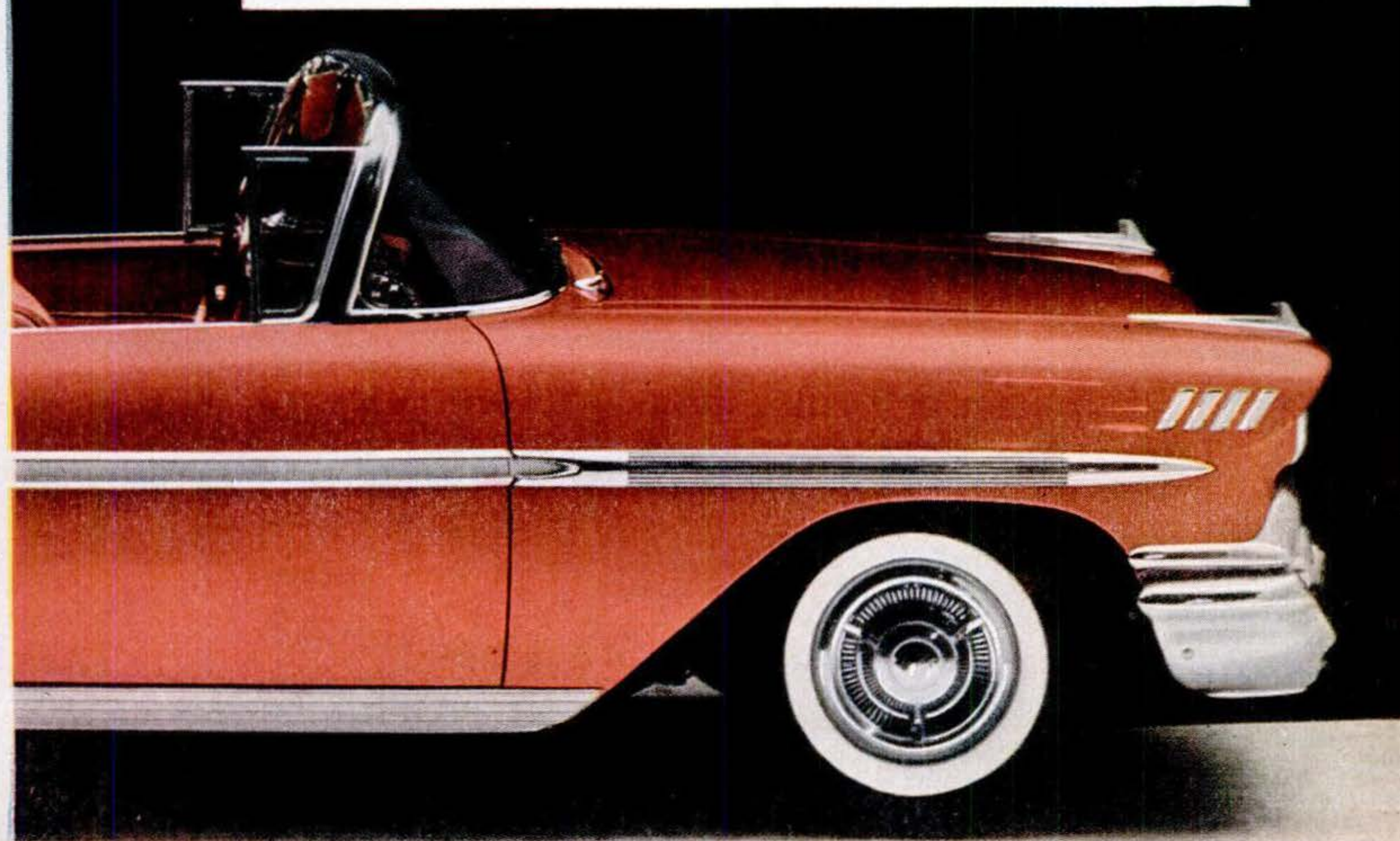
Auto Showroom: 1958

Chevrolet

WHEN they started planning the 1958 Chevrolet a couple of years ago, someone in authority must have said, "If we're going to make changes, let's do a job of it." They have. The sheet metal starts conservatively enough in front but gets astonishingly ambitious as it proceeds rearward. The fins are wings, no less. Underneath, there's an X-frame, like the Caddy's, and coil springs all around. There's a whopping new engine and a sports model called the Impala, shown at the left and below. Above is the Bel Air hardtop.



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Lincoln

IF YOU'RE shopping around for an automobile that's more than 19 feet long, stop right here. The Lincoln is the world's longest car. But it handles like a sports job, and it's one of the quietest cars to come out of Detroit for the new model year. That's due largely to integral body-frame construction. Everything

Rambler

THE Rambler has grown up. Brand new for '58, it has four headlights, a pushbutton torque-converter transmission, flared fins and optional horsepowers of 127, 138 or 215. The wagon has the familiar notched roof and travel rack. At 191 inches, the car continues to be the shortest in the U. S. seating six.

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above the running gear is welded together like a battleship. Then it's plunked into a tank of primer paint so that—on the factory's word—it can never, never rust. Some vital statistics: The height is 56.5 inches, down four from 1957. The engine, brand new, matches the heroic dimensions of the car, with a displacement of 430 cubic inches. The axle ratio is 'way down to 2.87-to-1.

Ambassador

BIG brother to the Rambler, the Ambassador shares the pushbutton drive. The grille is anodized aluminum, as are the panels extending the full length of the sheet metal. On a wheelbase of 117 inches, the car measures 201.4 inches over all. Its V-8 turns out 270 horsepower, or .8 hp. for every cubic inch.

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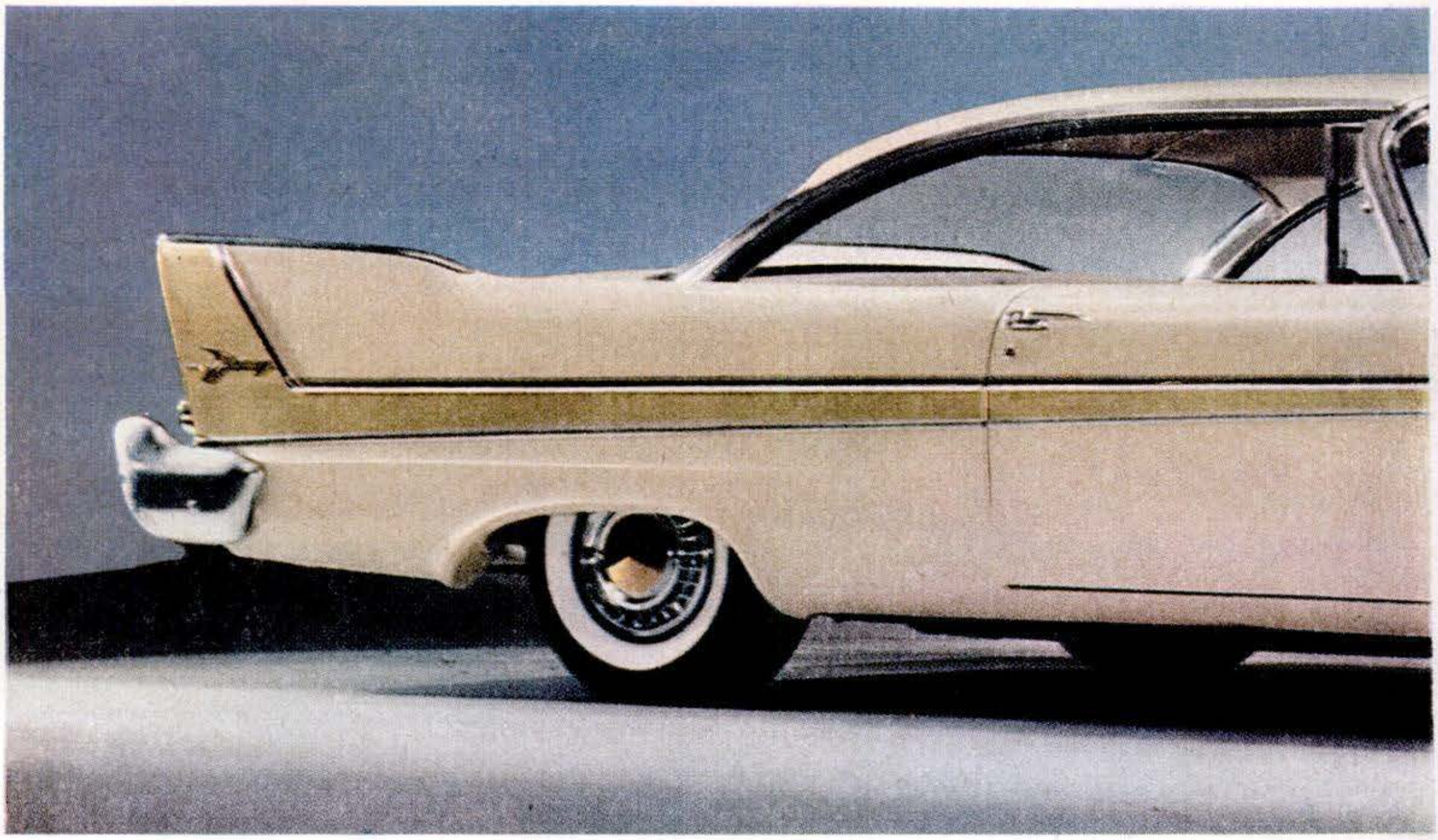
Auto Showroom: 1958

Plymouth

THE most popular car in the Chrysler Corp. stable will make a lot of fans happy—the ones who hoped that it wouldn't be changed much in looks for the new model year. The fins have that same bold flare. There *are* dual headlights in each fender, of course, and a horizontal-bar lower grille. Those "dorsal fin" front fender ornaments are higher. Turn signals are tucked in above the headlights. The tail lights are outlined in polished aluminum. A center section has been



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added to the rear bumper to take the back-up lights. When they're on, they throw red warning beams sideways. A stretched-out P-l-y-m-o-u-t-h adorns the deck lid. The top line of Plymouths, the Belvederes, have an aluminum insert on the rear fender. Increasing horsepowers and torque, which put a strain on manual transmissions (the automatic boxes are oil-cushioned), necessitated beefing up gears, lowering ratios. The getaway TorqueFlite automatic is available now on all lines. The snooty Fury (below) continues as a two-door hardtop.

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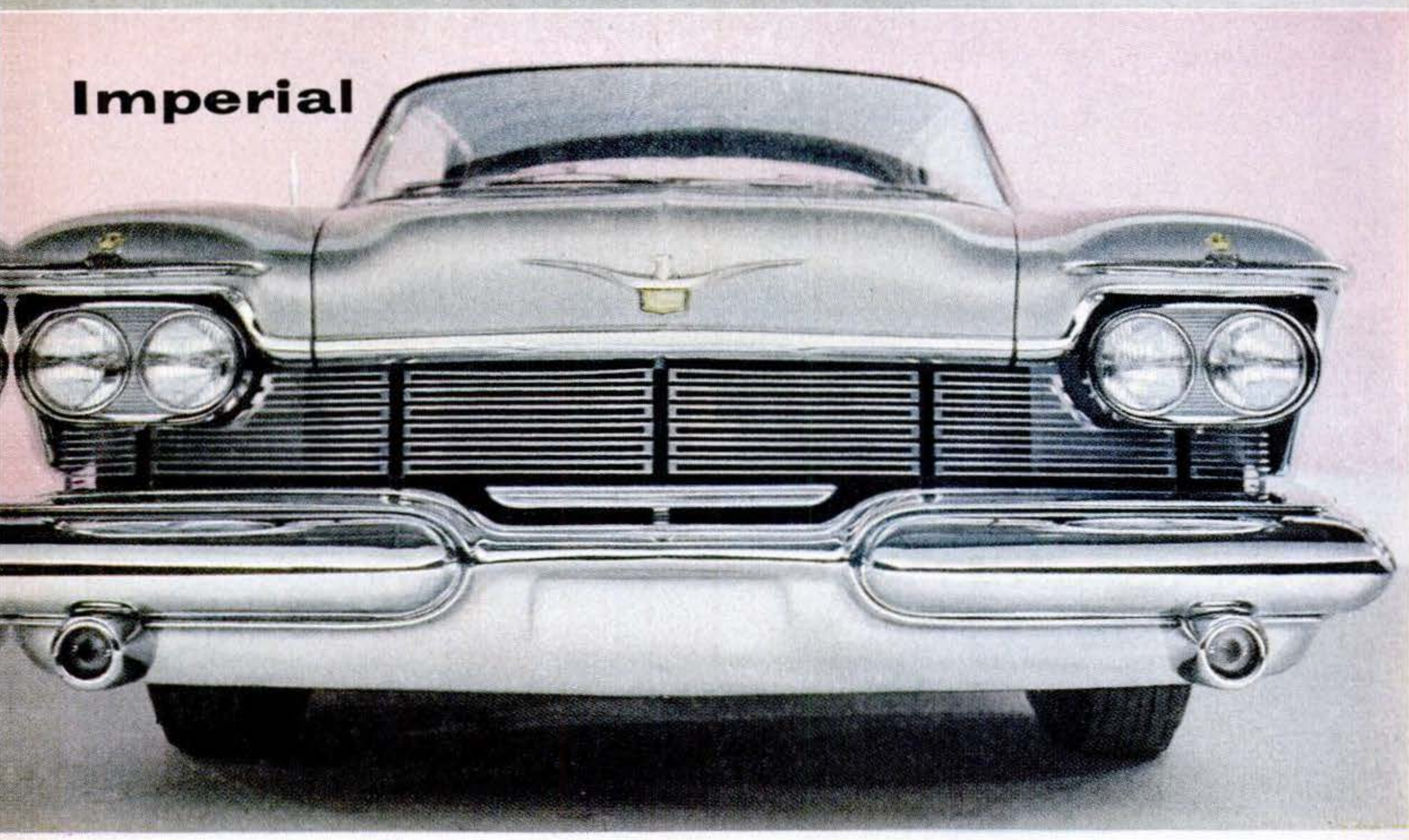
DeSoto

Imperial



TAKE a good look at these grilles. With Plymouth, the rest of the family of Chrysler Corp. cars—De Soto, Chrysler, Imperial and Dodge—have revamped front ends as their most striking change for the new model year. Like Plymouth, the Dodge can now boast four headlights for better highway illumination. The Imperial, Chrysler and De Soto had them for '57. De Soto's grille is a two-piece section of aluminum mesh, Chrysler's a perforated anodized aluminum arrange-

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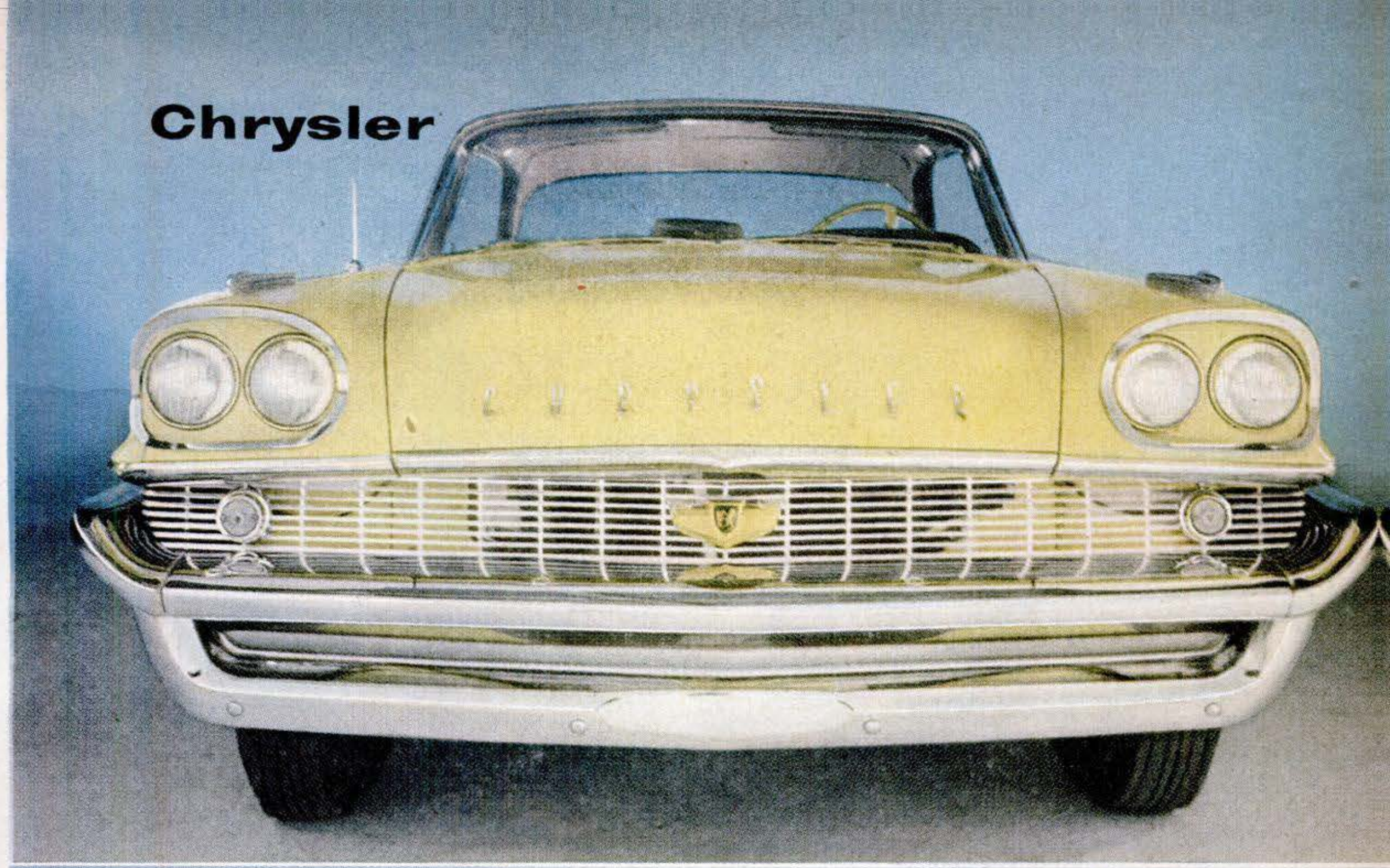

ment with horizontal bars. Imperial's consists of six sections of extruded aluminum and Dodge's has thin vertical and horizontal bars of chromed stainless steel. An industry-wide trend, the use of aluminum is partly for manufacturing economy and partly due to its corrosion-resistance. Anodizing (which is oxidizing) impregnates the metal with inorganic dyes. All Imperials, and hardtops in the De Soto, Chrysler and Dodge, have double-wrap windshields.

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Auto Showroom: 1958

Buick

THE motorist clapping his eyes on the new Buicks for the first time will notice two things before he blinks: The portholes are missing for the first time in 10 years, and the full rear-wheel cutout has disappeared. That's only a start in the changes. For a grille, the stylists have built in 160 little studs.

Studebaker

STUDEBAKER models are lower by as much as two inches except on station wagons. Hoods and grilles are new. Four headlights are standard on Presidents and Commanders, optional on Champions, not available on Scotsmen. There's new two-toning, lower seats, and an adaptation of the '57 fins on Hawks.

The hood is higher to enhance the driver's wow-what-power! feeling. The sweep-spear molding is still ,there, but decorative speed lines have been added to the rear fenders. Door-window frames are chrome on all models. All series designations are in gold. The Buick's mechanical innards have undergone revision too. There's a new optional transmission, new front brakes and a new twist on air suspension.

Packard

THE Packard has been added to S-P's Hawk lines of cars—sports sedans. The hood, part of the grille and the instrument panel are made of plastic reinforced with glass fibers. The rest of the grille is die-cast aluminum. The vinyl armrest trim overlaps on the sheet metal. The deck has a spare-tire imprint.

Corvette

AMERICA'S only sports car is coiffured with new speed lines, a louvered hood and four headlamps. The bumpers, fore and aft, are real this time. The 283-cubic-inch engine comes in four horsepowers—230, 245, 250, 290. For racing, there's a special cam. Instruments are clustered. For passengers: a hand-hold.

Continental

ONCE more bracketed with the Lincoln on the production line, the Continental shares the same body with minor variations. Instead of a horizontal-bar grille and back-bumper panels: latticework. The rear window slants forward, not back. Trim refinements are flossier. The controls are gratifyingly complex.

Chevrolet:

Lower, longer, livelier

Contrast between 1957 and 1958: slinky Impala (right) is four inches lower in silhouette.

By Devon Francis

WHEN Chevrolet introduced its 1958 models last month, it looked as though the engineers and stylists had jacked up the radiator cap and built a new car around it.

In this first completely new passel of Chevrolets in three years, the changes, big and little, run into the hundreds. Here are the main ones:

- An entirely new metal skin, styled to cause strong men to falter and women to wilt.
- A new frame and a type of body construction that suggests a trend toward no frame at all. The cars, on a bigger wheelbase, are nine inches longer.
- Coil springs all around for the first time in the company's history, with air springs as an option.
- More horsepower, but an evident reluctance to sell cars mostly on green-light getaway.
- A "street" version—as opposed to a Corvette racing version—of fuel injection that may well make history.
- A mating of fuel injection and automatic transmission for performance that is sheer sparkle.

The new automobiles are Chevrolets, all right. It says so on the front of them. But

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they are Chevrolets in name only. For this vehicle, a fresh, new phase has begun.

Let's take a look at the major changes, one by one:

The styling is superb, particularly in a number called the Impala, displayed as a dream car at the General Motors Motorama in 1956.

"We won't fret," remarked a Chevrolet man, picking his words cautiously, "if anyone refers to the Impala as a Baby Cadillac."

They shouldn't. Named after a fleet African antelope, the Impala *does* resemble a Caddy. The styling department has socked too many wind-splits into the convolutions of the sheet metal, but even that can't destroy the car's essential beauty. The same skin, minus some of the frivolous embellishments, has been pulled over the rest of the new Chevrolets—the Delray, Biscayne and Bel Air series. The Impala is billed as a part of the Bel Air line, but it's an even bet that it will stand on its own by 1959.

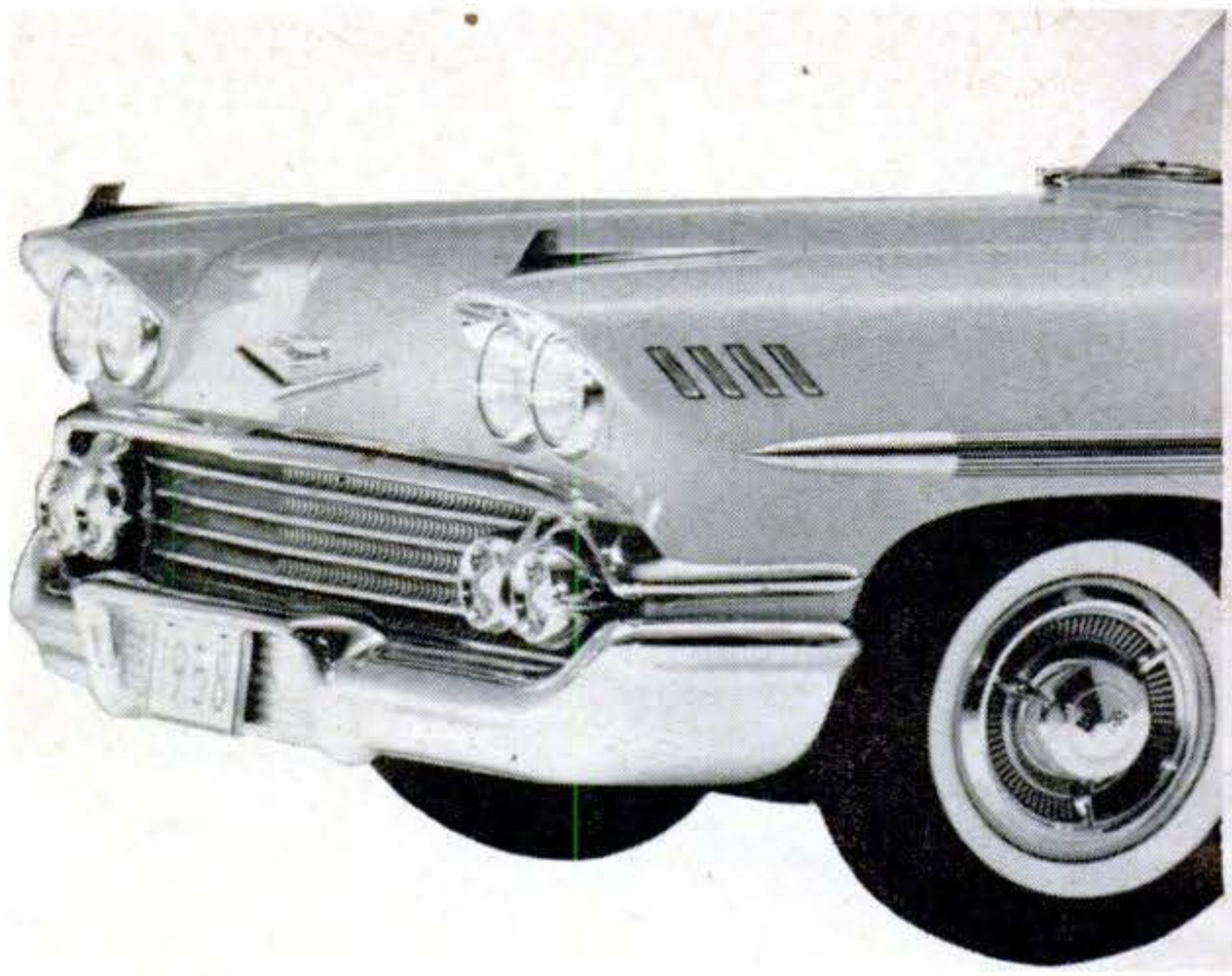
The names Delray and Biscayne are probably the products of some moonstruck individual on the Chevrolet payroll who shuddered at those bleak series numbers, the 150 and 210, for which the romantic tags were substituted.

The frame of the new Chevrolet (like the Cadillac's) is an X with no side rails. It has greater resistance to twisting and bending. It allows a lowering of the car without introducing wide door sills at the rear-seat "stepdown." The '58 Chevrolets are, in some cases, almost five inches lower than their '57 counterparts.

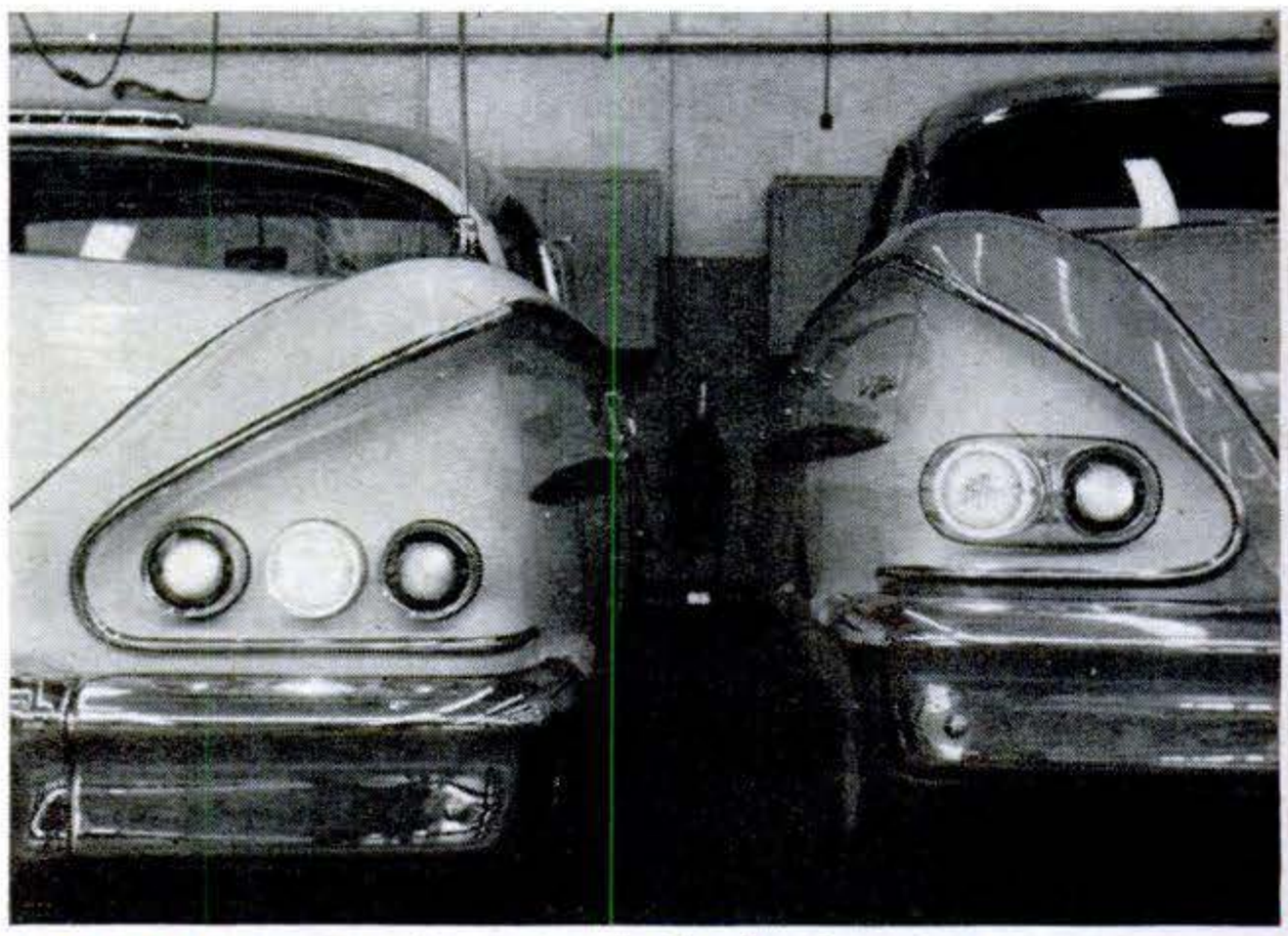
The entire body is beefed up. Cross members under the seats, where nobody looks anyway, hold body to frame. To the suspicious mind, all this smacks of a step toward the eventual elimination of the frame entirely.

The propeller shaft is now in two pieces, joined by a tightly anchored middle universal joint. That's partly to reduce what engineers know as "drive-line disturbances from unbalanced forces." In plain English, that means whip. One ounce of off-center weight in a long shaft two inches in diameter becomes almost 50 pounds of whip at 4,000 revolutions a minute. The shorter each section of shaft, the less chance there is of whip.

Despite coil springs front and back, Chevrolet's divorce from the torque tube,

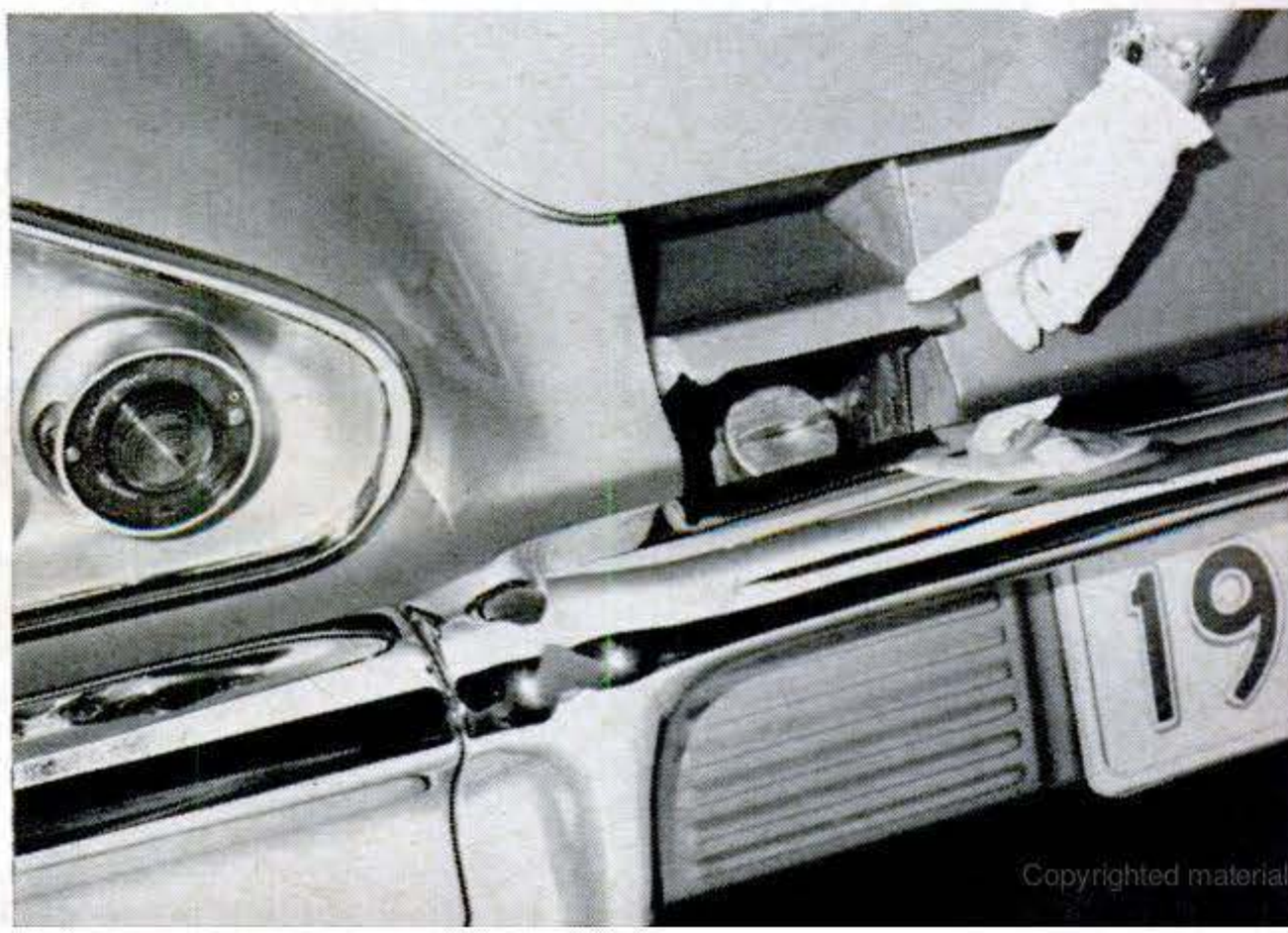


Top of the line, the new Impala comes either as



THREE TAIL LIGHTS (running light, back-up, stop and turn) are an Impala identification. Standard Chevy cluster is shown at right.

NEW FUELING POSITION above the bumper leaves rear fenders unblemished. Except for wagons, all models hold 20 gallons—up four.



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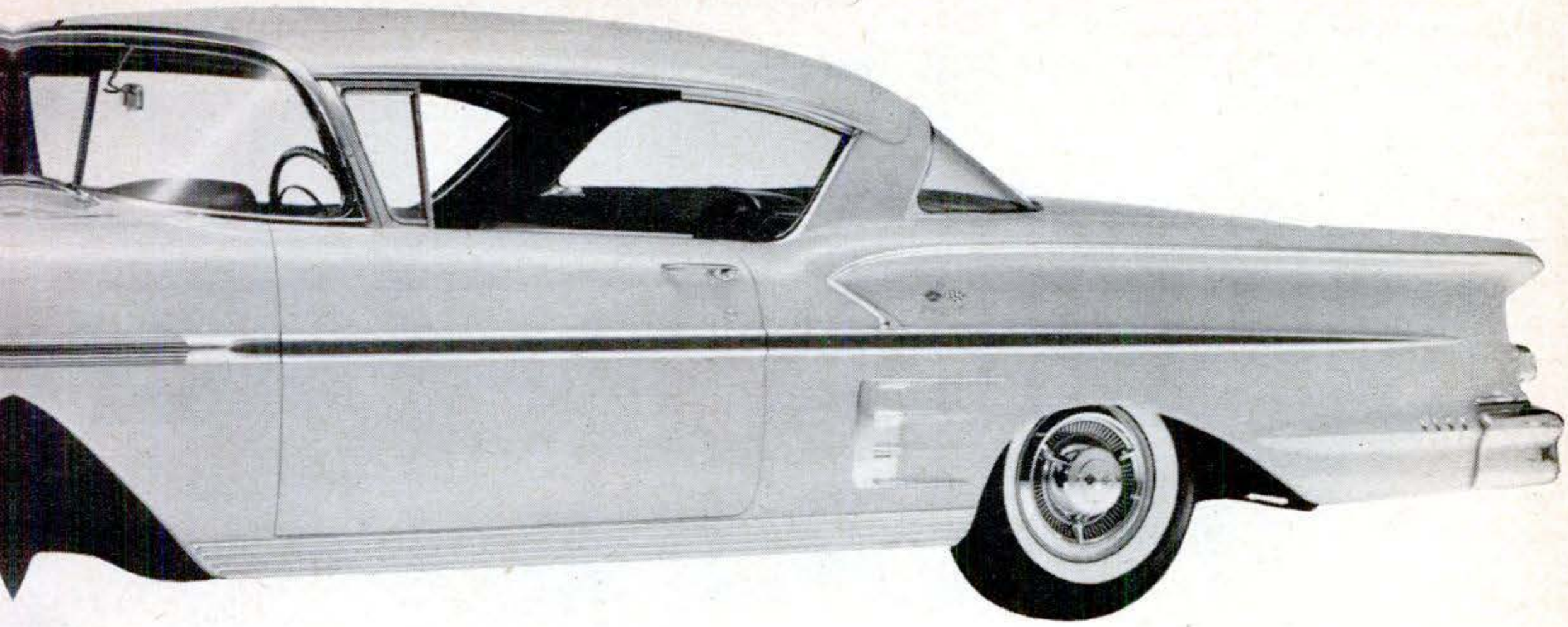
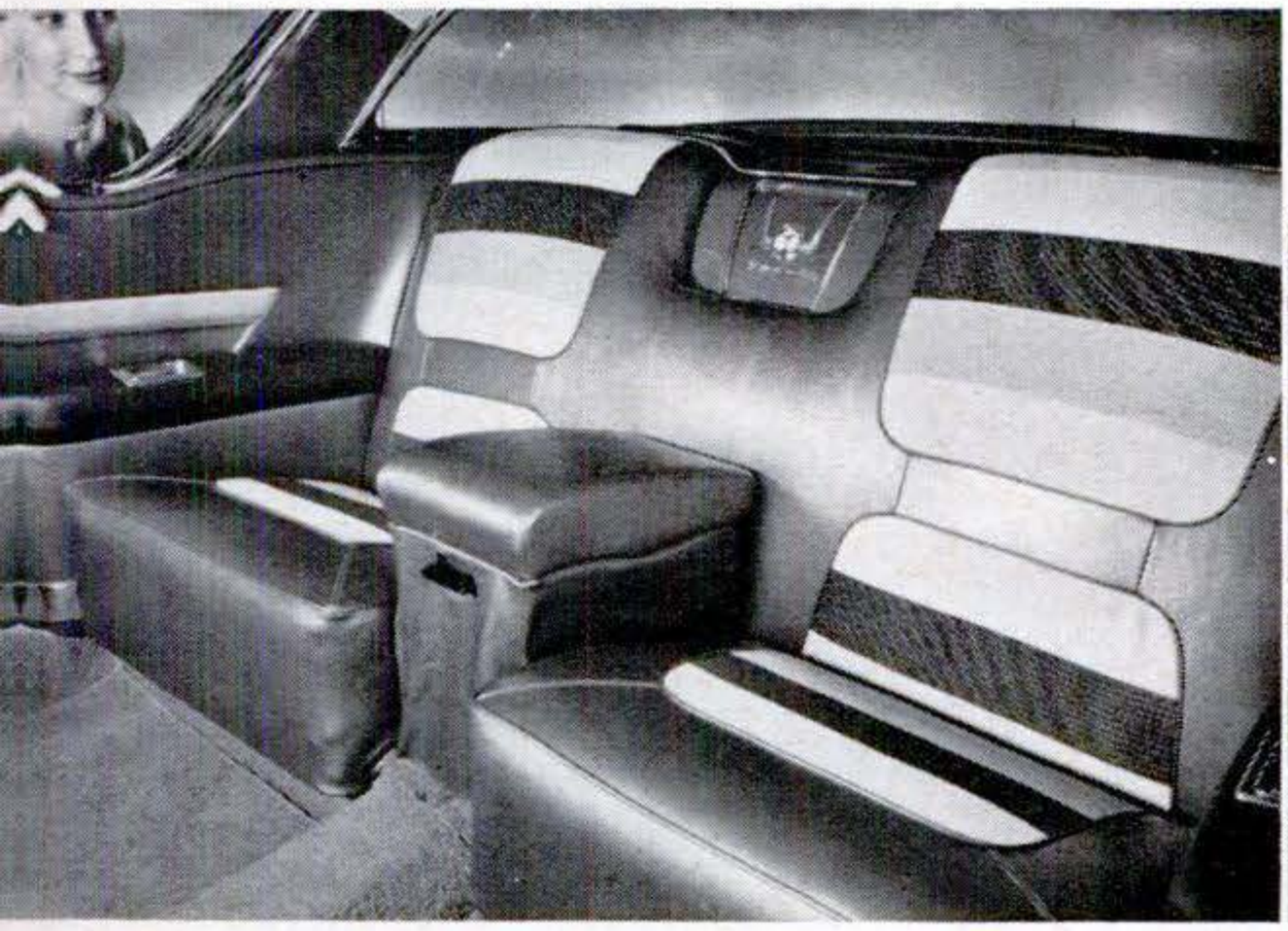
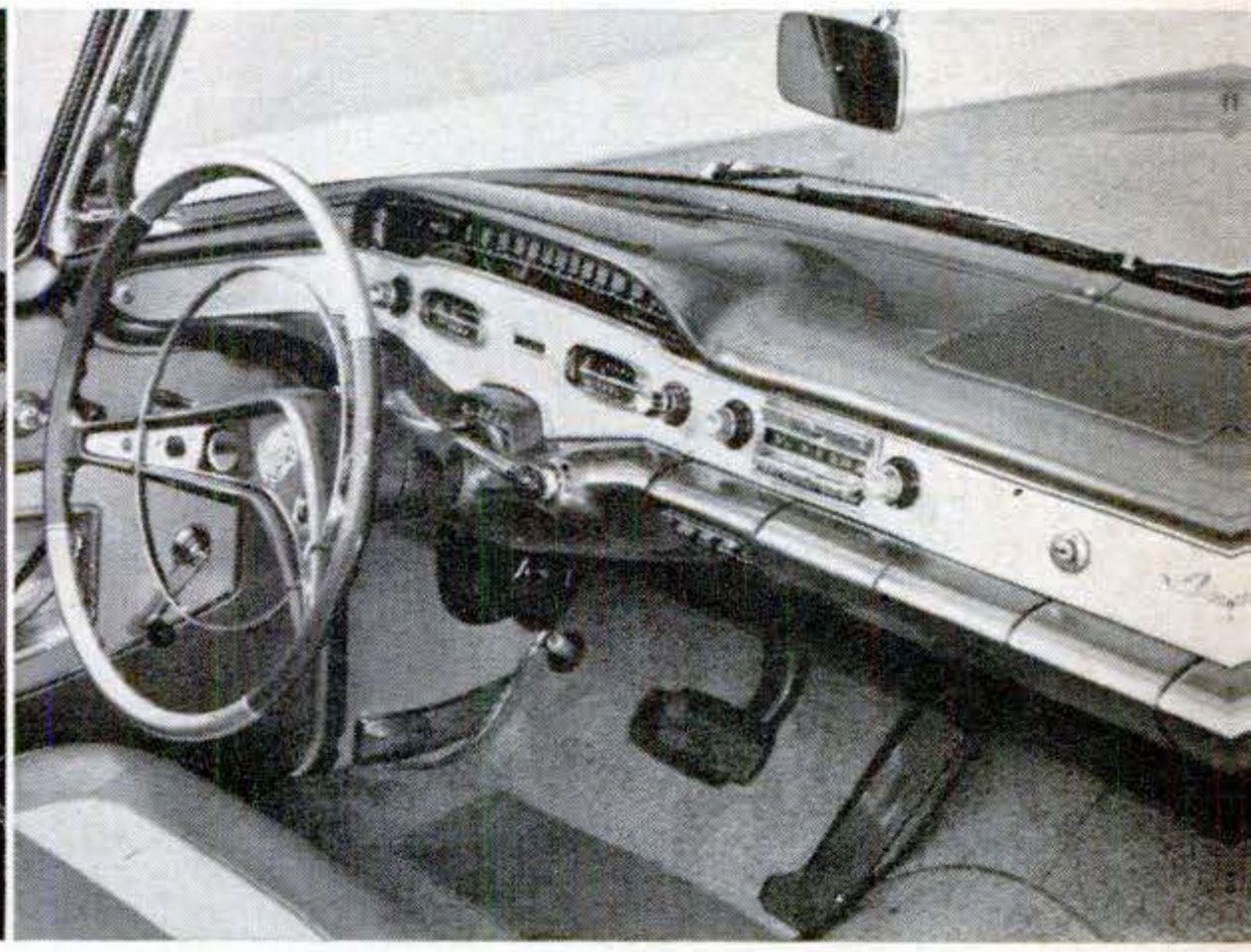


a convertible or as this svelte sport coupe. Its performance is comparable to its sleek looks.



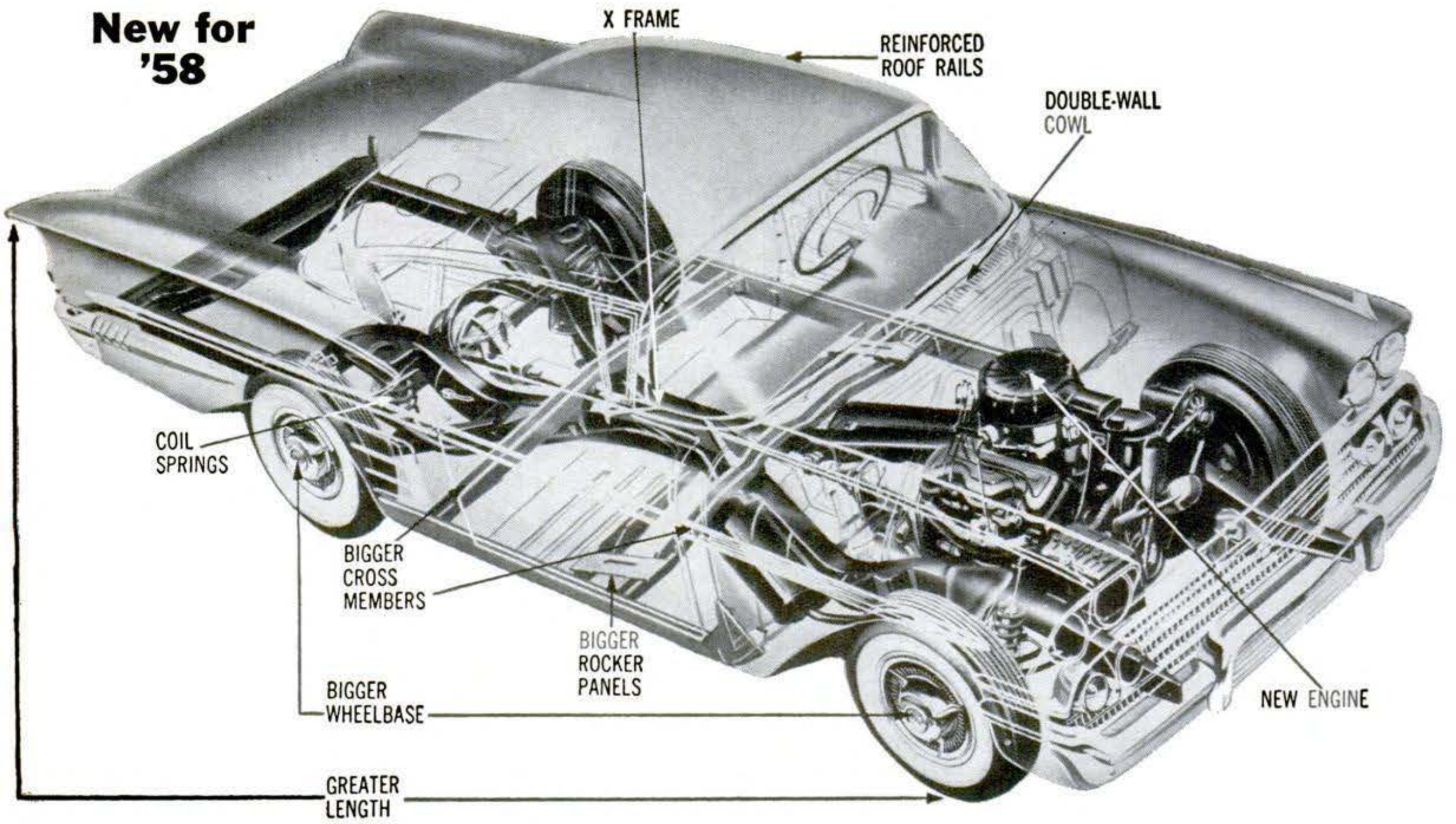
REAR SEAT of Impala, styled for only two passengers, features a fixed armrest with an extra radio speaker in back rest above it.



DISHED WHEEL is sports type. Automatic drive quadrant reads P R N D Gr (for Grade Retarder); standard quadrant substitutes L for Gr.

SPARE TIRE rides behind the wheel well, expanding trunk width to a whopping 50 inches; depth, including shelf, is almost five feet.

DUAL HEADLIGHTS (of course!) are eyebrowed; the gridded grille has concave ribs; top of the hood is completely free of ornamentation.



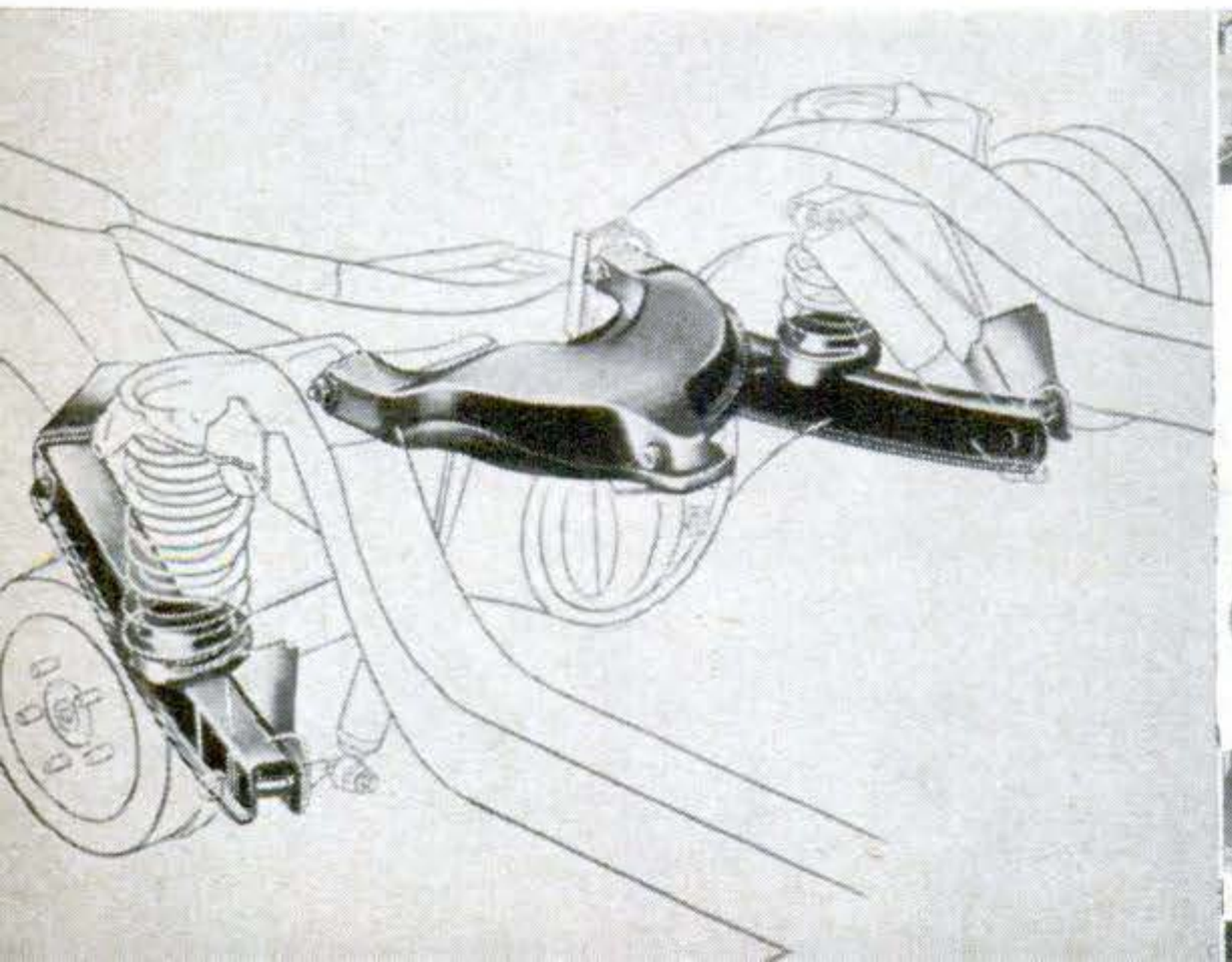
begun in 1955, is now complete. How the driving power of the rear wheels is transmitted to the frame without rear-end "squat" in takeoff is quite a trick. Different from the Lincoln's (page 114), it's pictured in the accompanying illustrations.

These coil springs all around, the biggest change in the car's suspension since the introduction of the "knee-action" ride in 1934, bring a two-fold explanation from Chevrolet engineers. The first, and obvious, reason was to accommodate optional air-cushion springs. It's hard to substitute air bags for leaf springs.

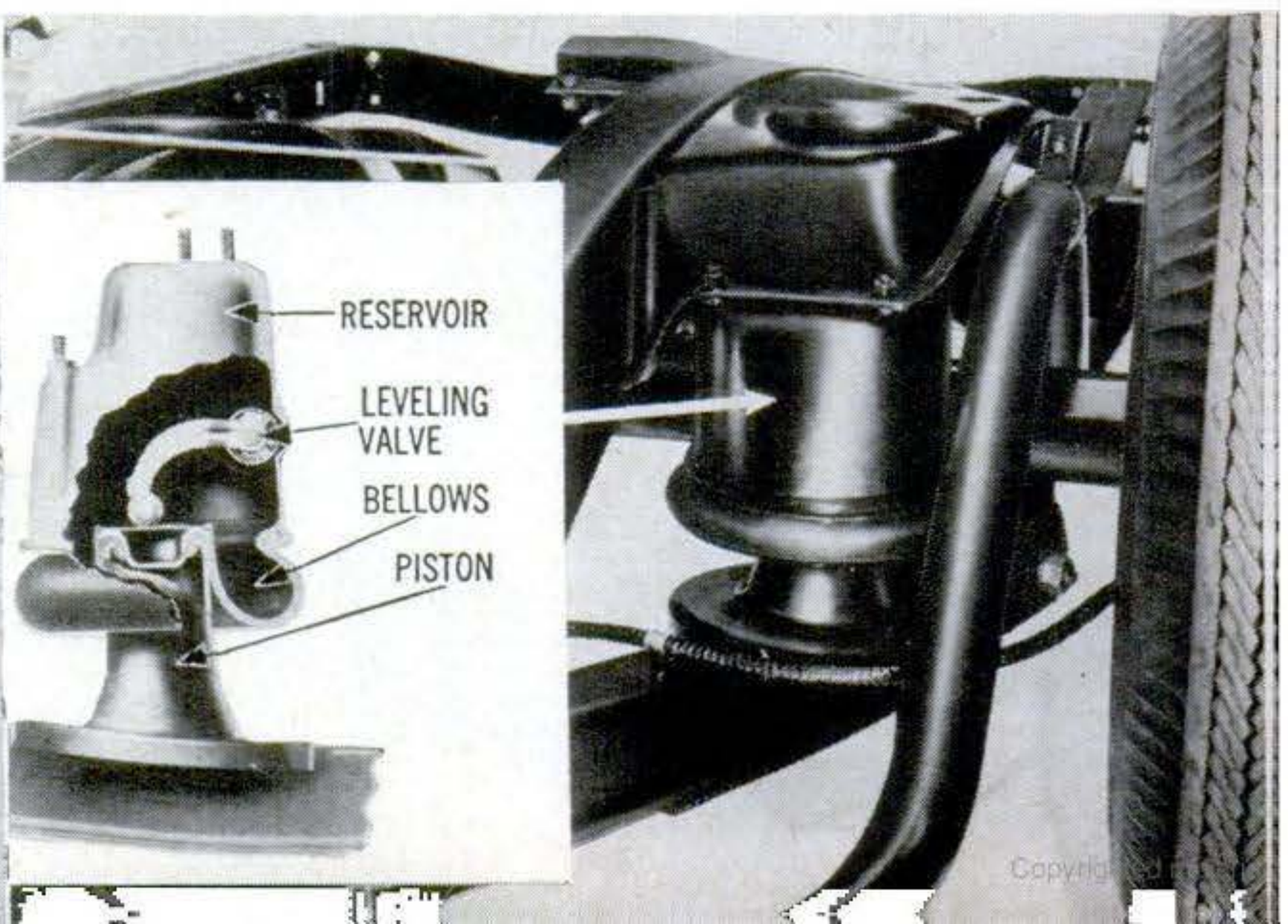
The second part of the explanation is ride improvement. They intercept more road shock between tires and body. The new ride results from boosting the amount of jounce-rebound wheel travel in front and matching up the bow and stern spring rates.

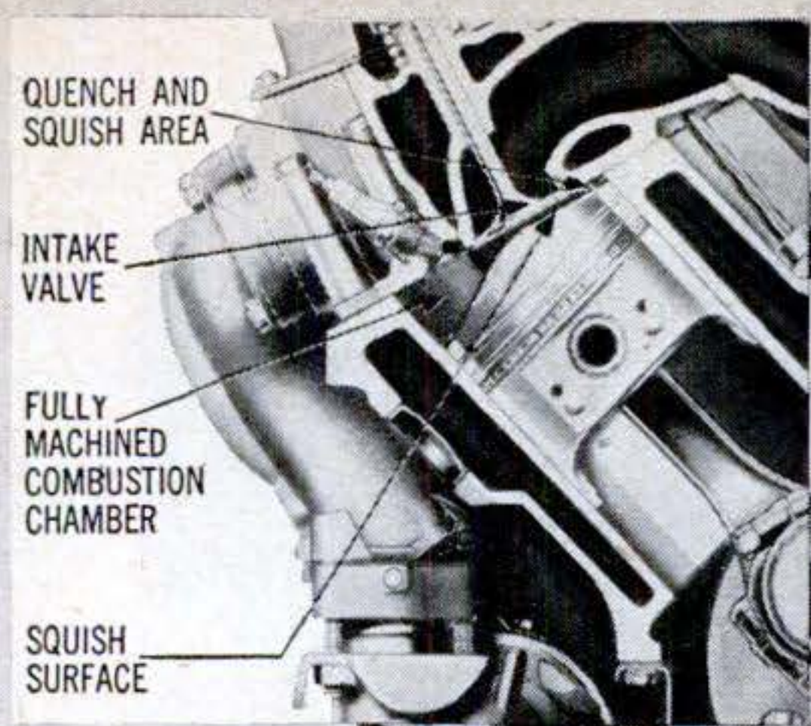
Air springs are no mere sales come-on. They work. Their principal purpose is to keep a car level regardless of the inequalities of load. The weight of people boarding a front seat is just about equally distributed between front and rear springs. But four-fifths of the weight of people boarding the rear seat is supported by the rear springs. That's the reason the back ends of cars supported by steel springs, when there are no rear-seat passengers,

THREE CONTROL ARMS, two outboard and one at differential, link axle to frame, almost eliminating "windup" and "squat" in accelerating.



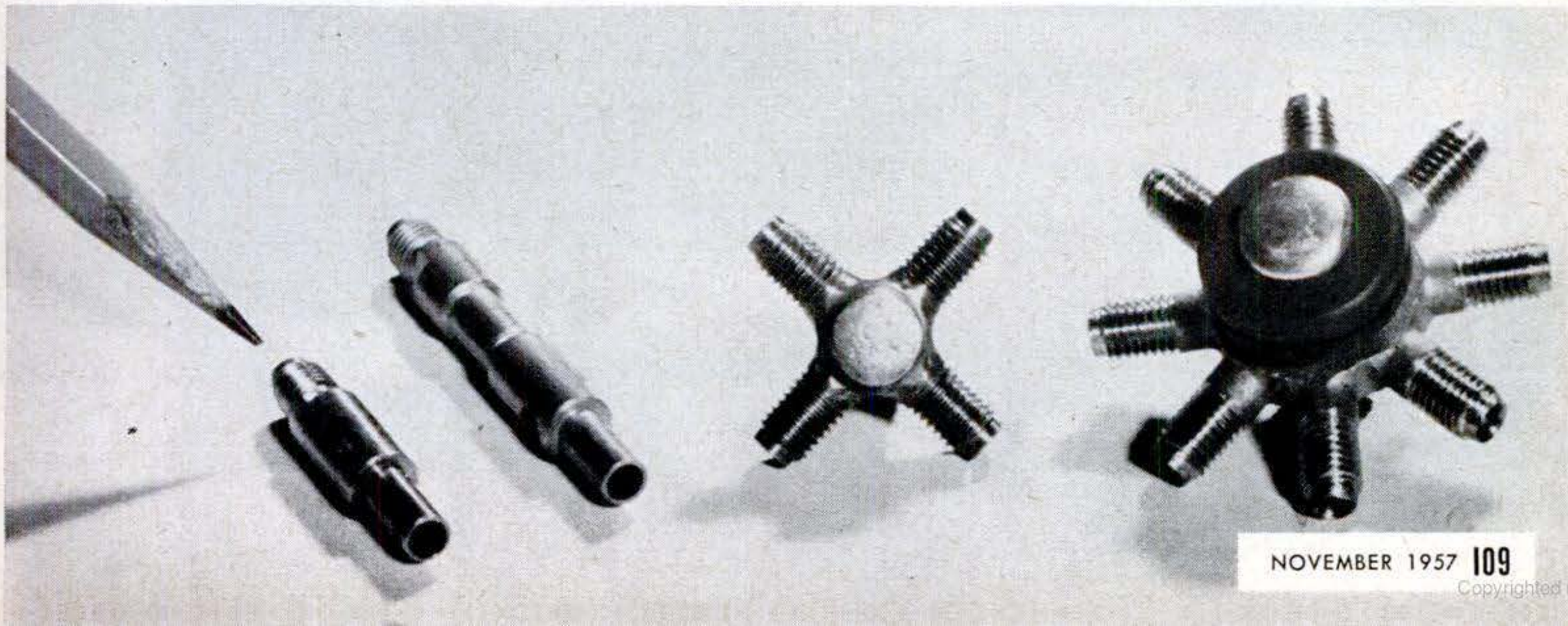
AIR SPRINGS, an option, make the car ride level fore and aft regardless of differences in rear-seat load or luggage in the trunk.





NEW THREE-CARBURETOR ENGINE has valve-cover cutouts to expose the plugs and reduce their temperature; heads are flat and the combustion chambers are machined into the block.

FUEL-INJECTION CHANGES FOR '58 improve idle, add snap to performance. New nozzles, compared with old (at pencil tip) are longer, extend farther into the manifold. Single, eight-outlet fuel distributor (right) replaces two of four outlets each, prevents dribble at idle.



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RESTYLED CORVETTE has four headlights and transverse louvers on the hood. Loaded, it's 51 inches high. Bumpers now attach to the frame. A four-speed manual box is available.

hump up—the springs must be tailored to a rear-seat load. When passengers climb in there *and* luggage is crammed into the trunk, the springs sag. The rear window often is scuttled to the point where an inside rear-vision mirror is useless.

Air springs automatically pump up to compensate for the load.

Second to the level ride as a reason for air springs is their shock-absorbing characteristic. Almost no road shock at all reaches the steering wheel. Moreover, on hard jounces, the car body goes up once and comes down once. That's all. There are none of the dying tremors of oscillation that steel springs impart.

"That's it," remarked a Chevrolet engineer last August at the General Motors Proving Ground near Milford, Mich., as we hit a pot hole in an air-sprung 1958 Chevrolet. The car jounced once and squished into rebound. "It's dead. Feels like putty."

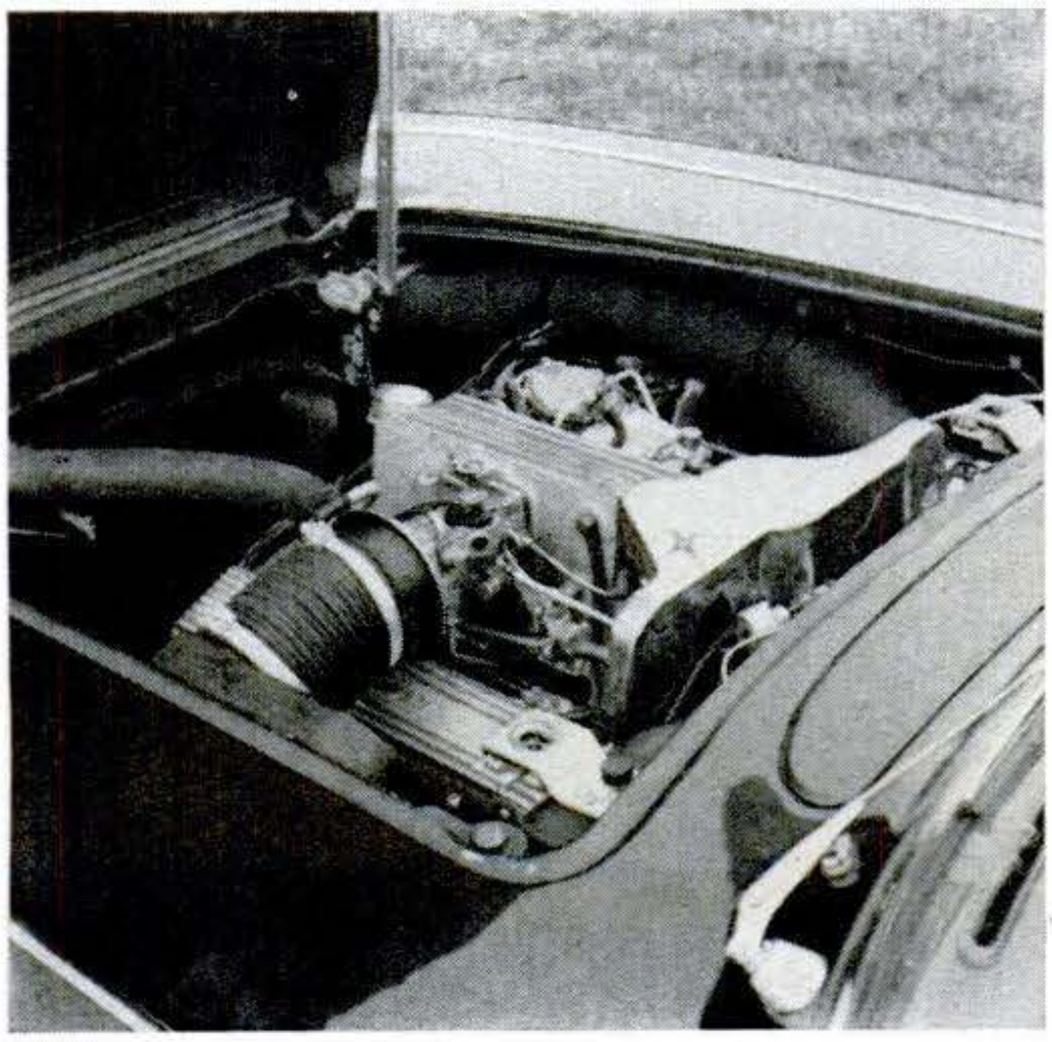
The fact is that Chevy's new steel coils are almost as "dead."

Chevrolet's prime engine news is not their big hunk of hardware that displaces an incredible 348 cubic inches—though it *is* an option—but, rather, what has been done to the fuel-injection system announced a year ago.

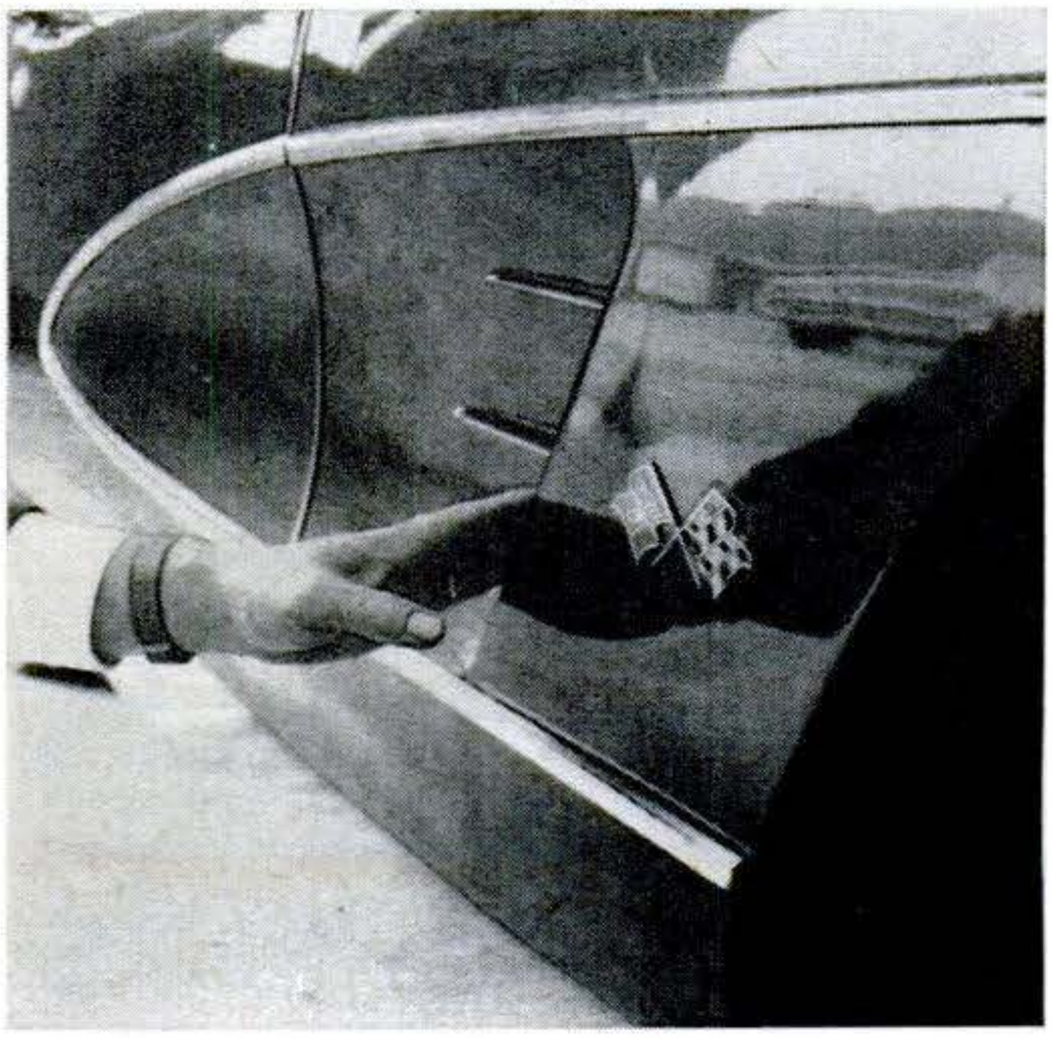
Chevy's fuel-injection engine was put on the market, in an excess of anxiety, be-

[Continued on page 270]

COMPRESSION RATIO of Corvette's fuel-injection engine remains 10.5:1. Dual four-barrel carburetors and special cam are optional.



FENDER SCULPTURING, outlined in chrome and extended back into doors, is retained, but is modified by flush paneling at the wheel cutout.



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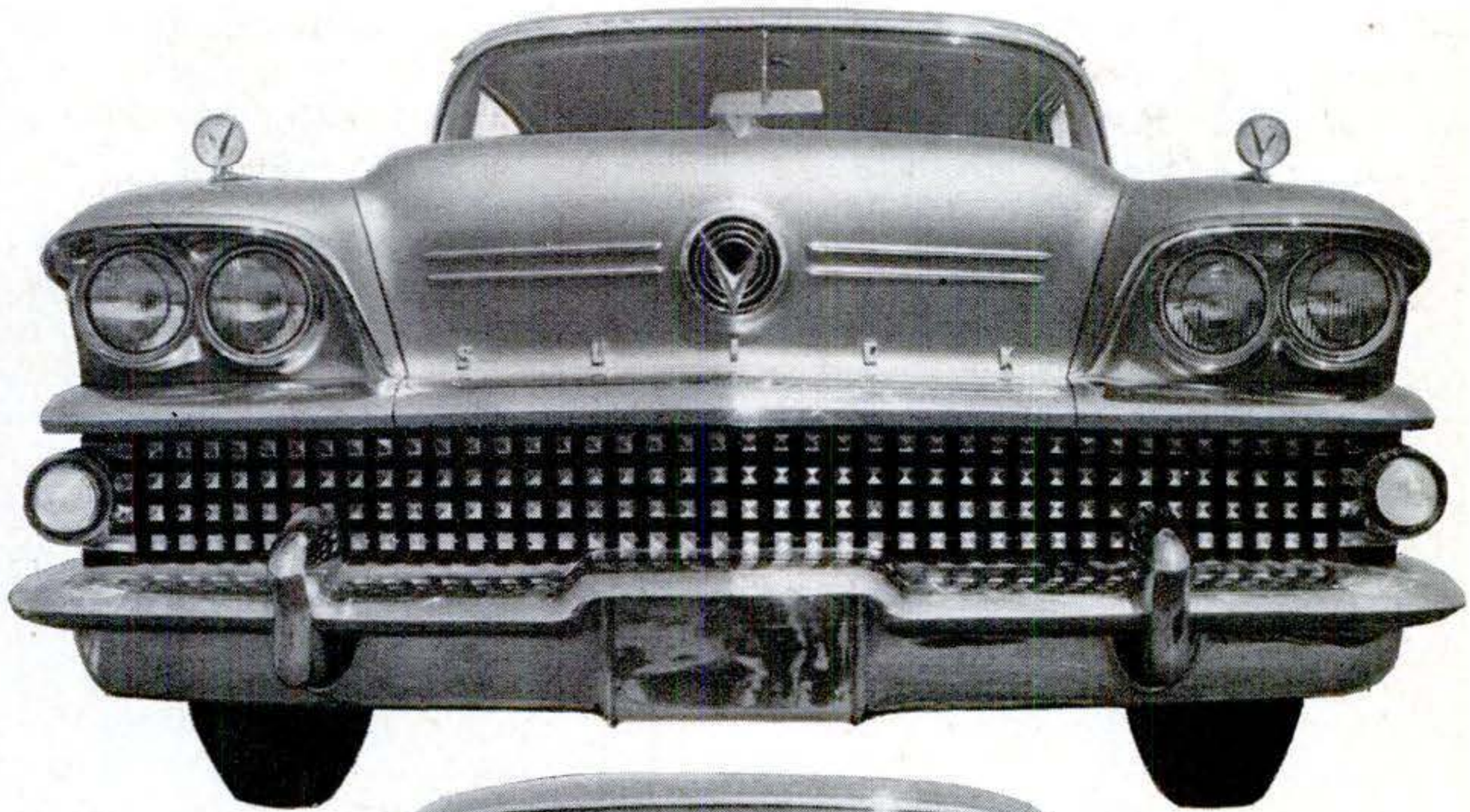
Buick:

New Look, New Transmission



Identify the '58s by the knobby grille in front and the big, lined bumper in back.

EACH fall, auto manufacturers publish confidential "brag books" designed to fill in employees about the new models. Buick's 1958 brag book contains this boast:

"It has been the practice after introducing a completely new body to do a face-lifting the following year. Well, we have taken our 1957 models and not only face-lifted them but also tail-lifted them and side-lifted them until on some models there is not a single exterior surface the same as 1957."

This refreshing burst of candor stops short of telling why such costly changes were made. The reason: 1957's styles did not lure the customers in normal numbers; Buick lost its cherished third place in sales to Plymouth.

For the 1958 come-back try, Buick brings to the fray these main changes:

- Optional air springs, which render the car's already soft ride even more pillowy.
- New front brake drums, combining cast-iron liners in air-cooled aluminum

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bodies, for more fade-resistant brakes.

• A fancy new form of Dynaflow automatic transmission that gives better acceleration and downhill braking.

• A host of "appearance" changes in addition to the new sheet metal—a dramatic new grille, dual headlamps, new wheel covers and bumpers, and different rear windows. Someone at the factory, taking his courage in hand, has eliminated two historic Buick trademarks—the full rear-wheel cutouts in the sheet metal, and the row of little portholes or woodpecker doors along each side.

How does it seem? The extent of the changes need not alarm Buick lovers. Its engine still purrs like a kitten at cream. It still storms away from a traffic light with fine vigor. Its ride still feels as if you had had a shot of anesthetic in the rump—you can't feel a thing. The hood line has been raised—alas!—to give the driver a greater sense of power, at the cost of forward visibility for not-so-tall drivers. Offsetting that, the Buick people—bless their hearts!—have kept horsepower and torque exactly at 1957 levels.

Floating on air. To car designers, air suspension has the big advantage of eliminating a painful compromise. With steel springs the designer must choose between a low spring rate (soft, easily deflected springs) to get his good "boulevard ride" and a high spring rate (stiff, tight springs) to get acceptable handling on rough roads or with heavy loads. His painful compromise arises from the fact that any given steel spring has essentially only one rate.

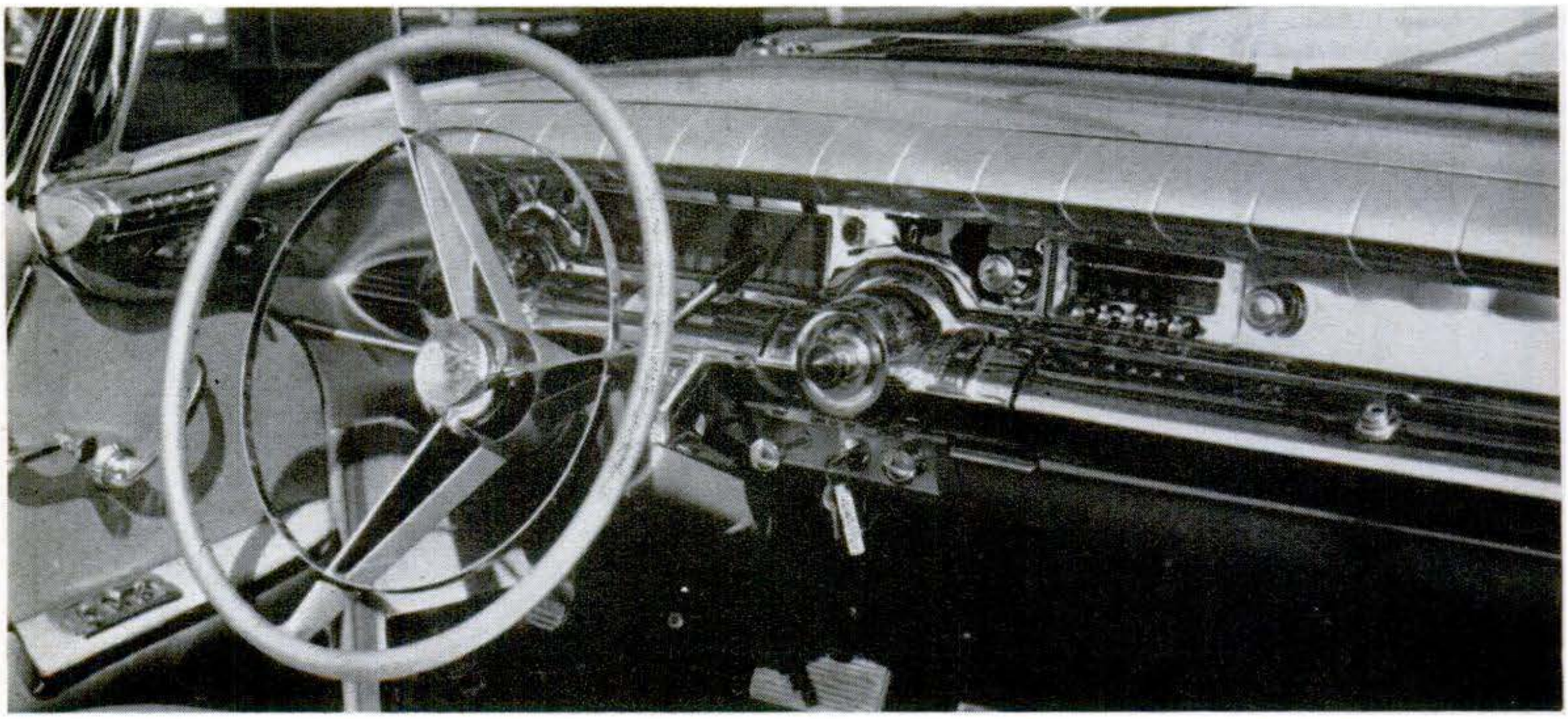
This isn't true with air bags. On an "Air-Poise" '58 Buick the spring rate is 60 percent softer *for the first inch* of wheel deflection. This gives the pillowy, smooth-road ride. But beyond that inch the spring rate progressively stiffens, reducing wheel shake and rebound when, say, the car slams at speed along a hole-pocked road.

Aside from variable-rate springing, air suspension can have the additional virtue of providing a constant "trim height" regardless of load. The car doesn't list like a tramp steamer when you pile in people and baggage; its headlight aim is not fluked with every variation in load.

To attain these virtues, the suspension uses four air bags that normally work at some 100 pounds' pressure; a piston compressor of five-cu.-in. displacement that can deliver air at 290 pounds; a big, sturdy air tank located between the front frame members; and an elaborate network of air lines and control valves. Despite the system's complexity, it will not, Buick thinks, give owners much trouble in service.

Found: a use for fins. Ever since Buick introduced its torque-converter Dynaflow transmission a decade ago, holding back on downhill running without excessive use of the brake pedal has been a problem. The box just didn't make much use of engine drag. As horsepower

[Continued on page 246]



Steering wheel provides more knee room. Instrument panel roll has soft nose for safety.

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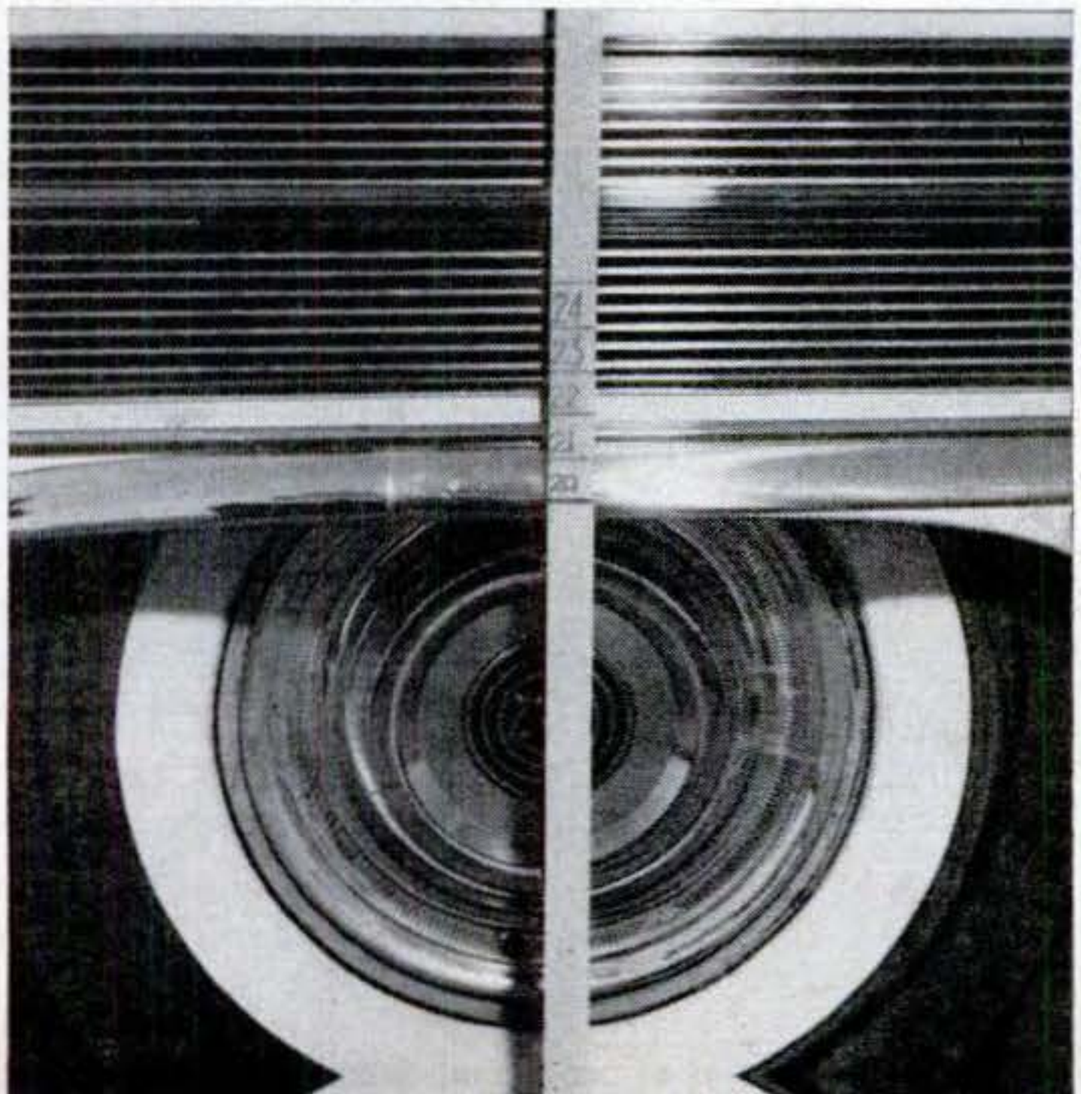
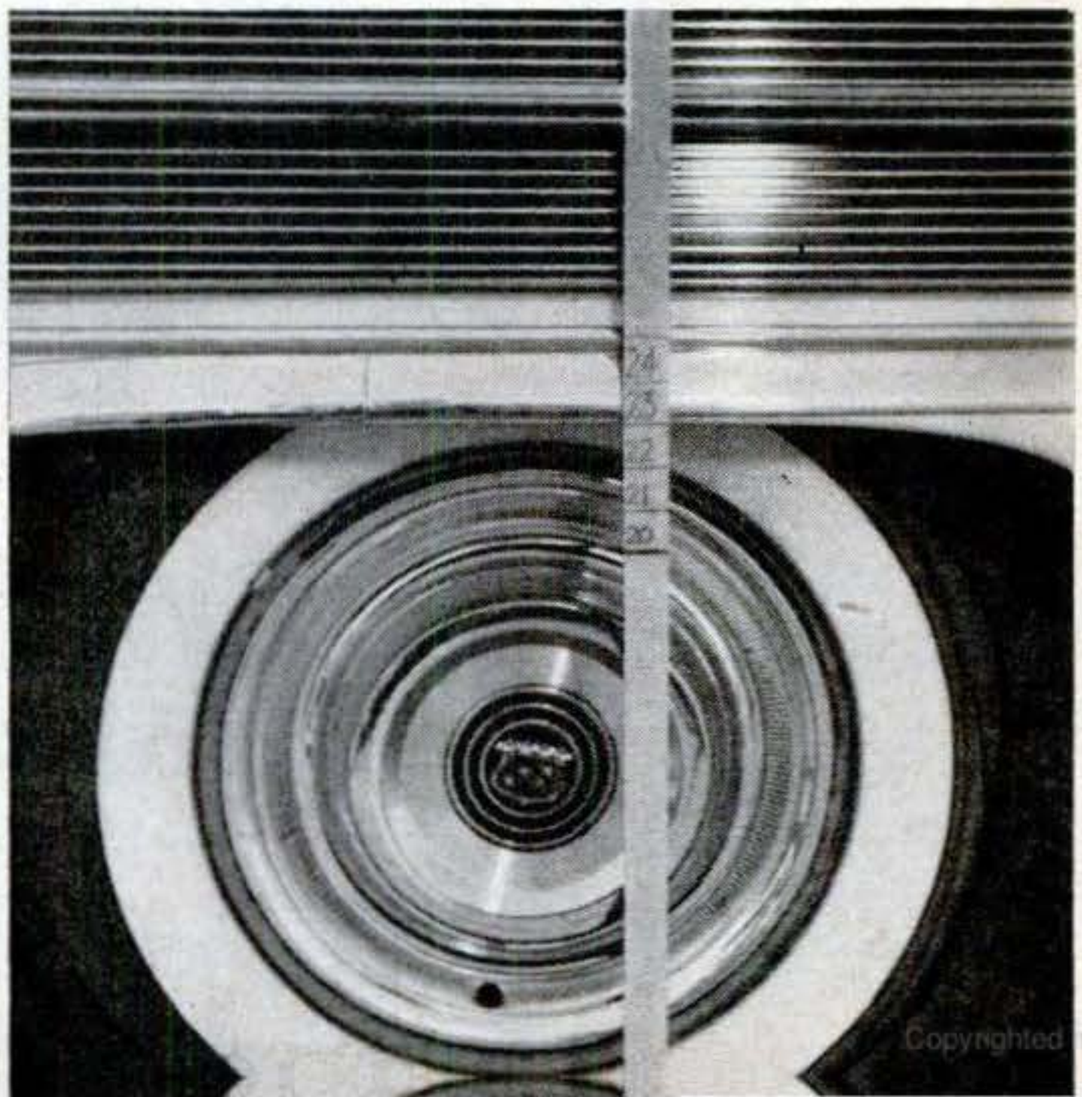
Compressor (arrow) pumps air for air-bag springs, stores it in the reservoir at lower left.

HIGH-RAMP DRIVEWAYS or crowned roads present no clearance problem to a Buick equipped with air springs. Flipping a switch raises body a full four inches above normal height.





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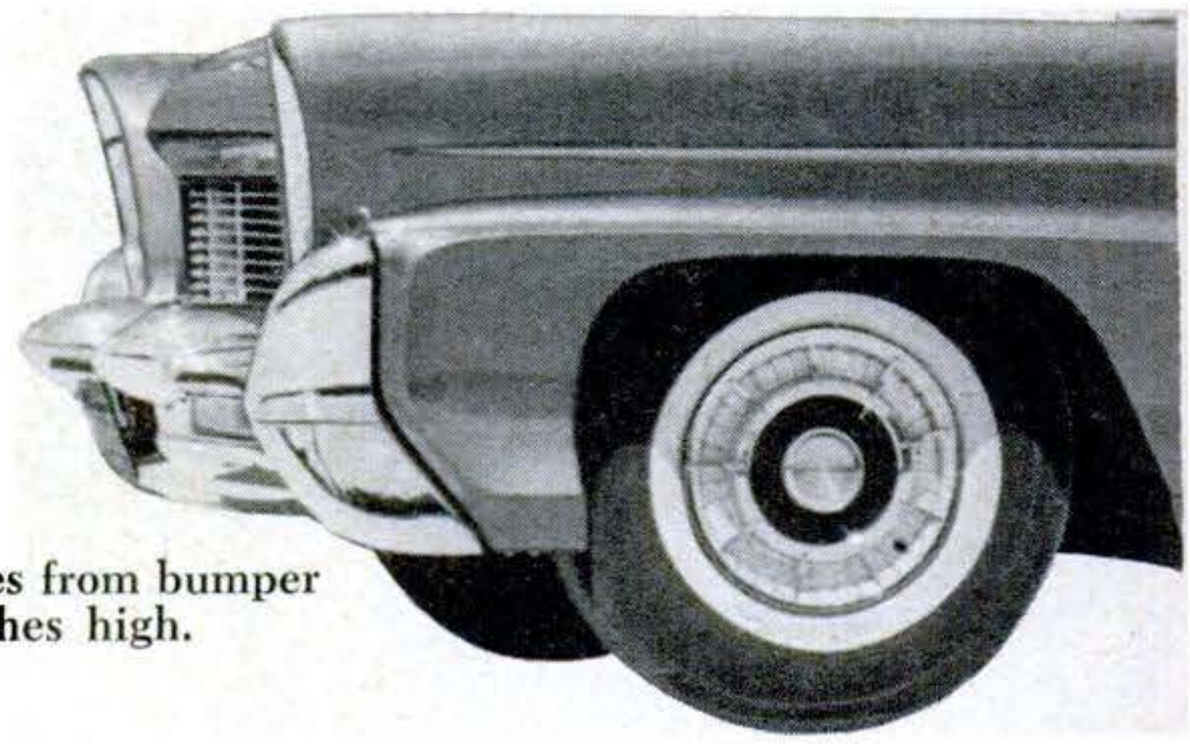
Lincoln: World's Longest Car

Beefy and powerful, '58 models may forecast an industry trend: They've thrown away the frame, fastened machinery to the body



NEW LINCOLN stretches 229 inches from bumper to bumper, stands only 56.5 inches high.

ENGINE CRADLE IS BUILT into body itself. The panels and beams for this whole structure are put into a "buck" or jig, held rigid by hydraulic clamps and then spot-welded. Cups for coil springs are in sheet metal. In front, bumpers and suspension mount in the side rails.

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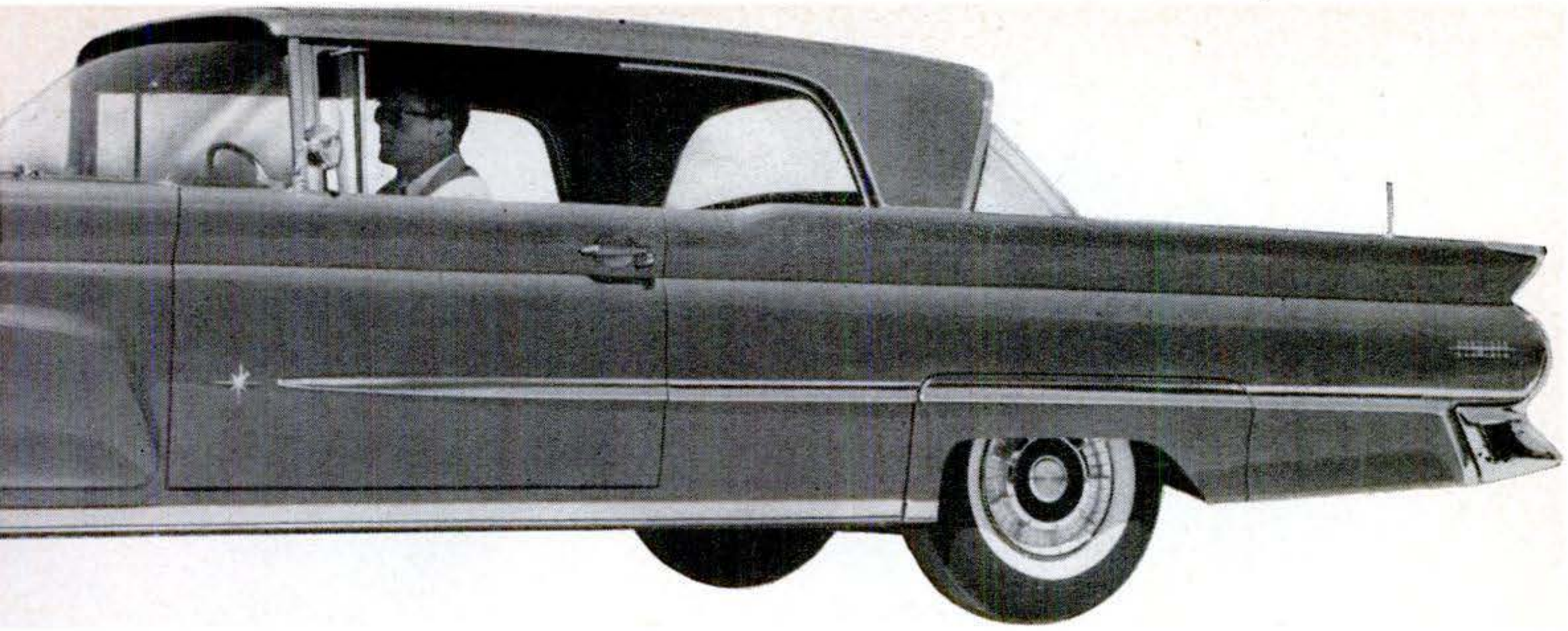

THE Lincoln division of the Ford Motor Co. has announced its second covey of dew-fresh cars in two years, and a first glance at them inspires the suspicion that the people who designed them had gone off their rockers.

At a time when there are less than a dozen states left in the Union with unrestricted highway speeds, the 1958 Lincolns have a stupendous 375 horsepower.

At a time when automobiles are fighting for space on the roads, the 1958 Lincolns are the world's longest production, sedan-type passenger vehicles. Measuring more than 19 feet between bumpers, they are seven inches longer than Cadillac's forthcoming 1958 coupe, 12 longer than Caddy's four-door. They are five inches longer than Chrysler's 1958 Imperial.

But in point of fact, the size and power probably are the least of the attributes of the new Lincolns. Eight years ago Ford Motor began planning for revolutionary changes in this automobile, and now they have come to pass:

- For the first time in 19 years, a bill of divorcement from the Mercury is in effect. The Lincoln has a production line of its own. It's free of association with a middle-priced car.
- For the first time in its history, the car has no frame—the body is "unitized."

Incidental to this is the death of the Continental Mark II, Ford Motor's posh chariot for millionaires. From now on, the Continental will be a Lincoln by another name, only slightly plushier, slightly costlier, slightly different in outward appearance.

The real story of the 1958 Lincoln lies in its construction.

It's a harbinger of things to come in the automobile-manufacturing business. American Motors (and one of its predecessor components, Nash) has built unitized bodies since 1940. Design and production engineers of both General Motors and the Chrysler Corp. are showing more than a casual interest in Lincoln's mammoth new manufactory at Novi, Mich. The bodies of the 1958 Ford Thunderbirds will be unitized.

Three-quarters of all European cars have unitized bodies. That includes the importations made by U. S.-owned companies—the English Fords and GM's British Vauxhalls and German Opels.

For the manufacturer, the unitized body simplifies car production. For the motorist, it practically eliminates body squeaks. It is believed to provide greater safety in collision. It makes for a quieter ride. It also—let's be dispassionate—complicates the job of sheet-metal repair.

A kinship exists between the Lincoln's construction and that of an airplane. Part of the strength of the Lincoln's body is in the stressed skin that forms a rigid box. Part of it is in longitudinal stringers, or beams, and heavy cross-members that are integral with the sheet metal. The Lincoln's engine cradle bears some resemblance to that of an airplane.

There were skeptics among Lincoln's body engineers when the new factory began running sample copies of the 1958 cars through the production line. Would the body shell take the weight of that

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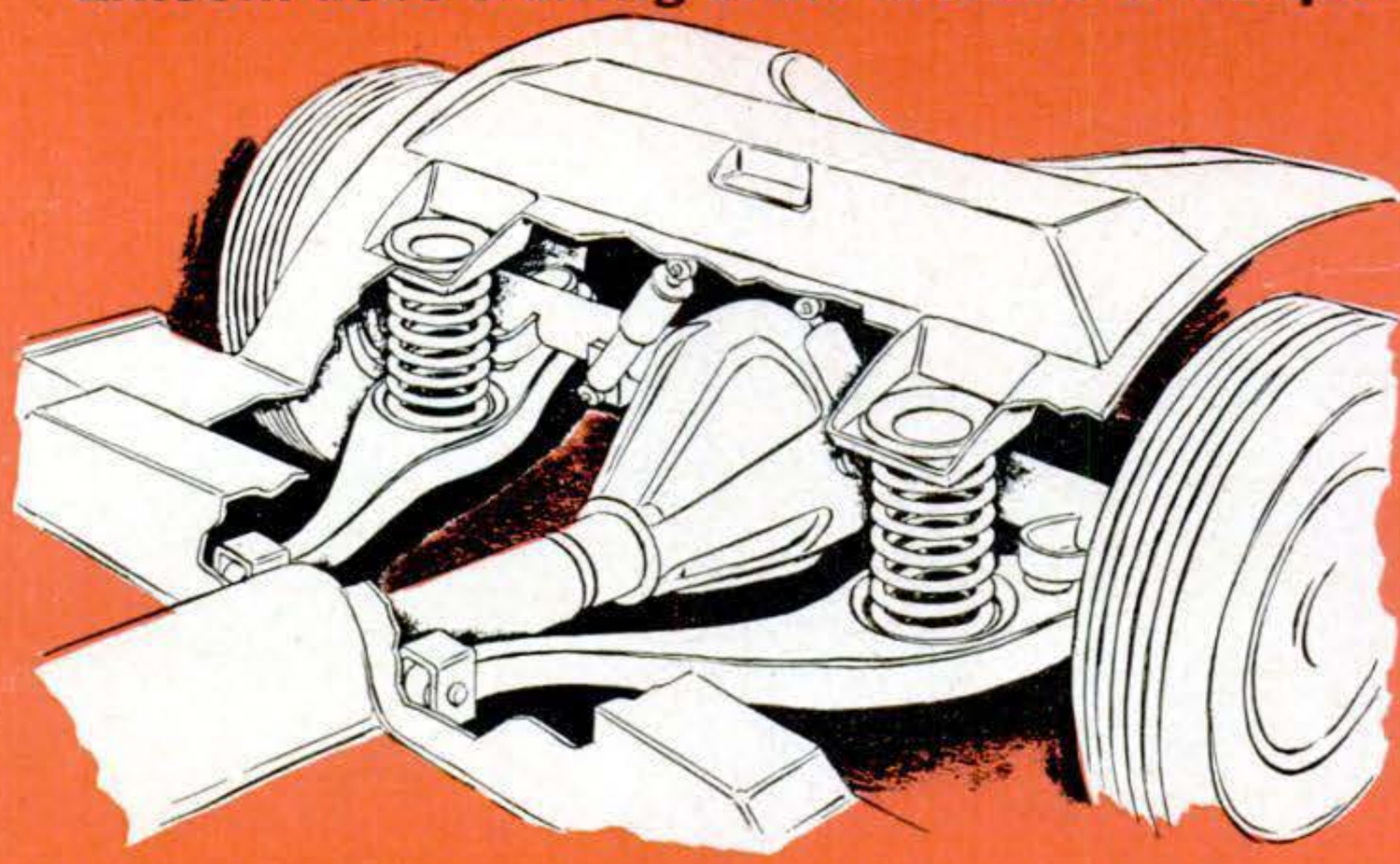
Lincoln uses trailing arms instead of torque-tube drive



REAR COIL SPRINGS normally call for torque-tube drive, as in Buick and American Motors cars. Here trailing arms, hinged to a rear cross-member, transmit torque from axle to body. Achieving unusual fore-aft stability in starts and stops, this propulsion method is used also in Cadillac's Brougham, in the Renault, Citroen and some Lancia models.

heavy engine without bending? Would the doors continue to fit?

The first 75 automobiles carried bits of masking tape pencilled with arrows at points where the doors mated with the bodies. The engines were dropped in. The arrows didn't budge. Then some of the cars were driven over wring-out roads at Ford's Kingman, Ariz., desert proving ground. The arrows still didn't budge.

For production-line engineers who accepted hammers and two-by-four timbers as tools necessary to car manufacture, this was a revelation. In conventional body-building, the hammer knocks the skin into place where the die has erred. The timber on a fulcrum springs balky sheet metal into mating position. In the new Lincoln plant, there are no hammers, no two-by-fours.

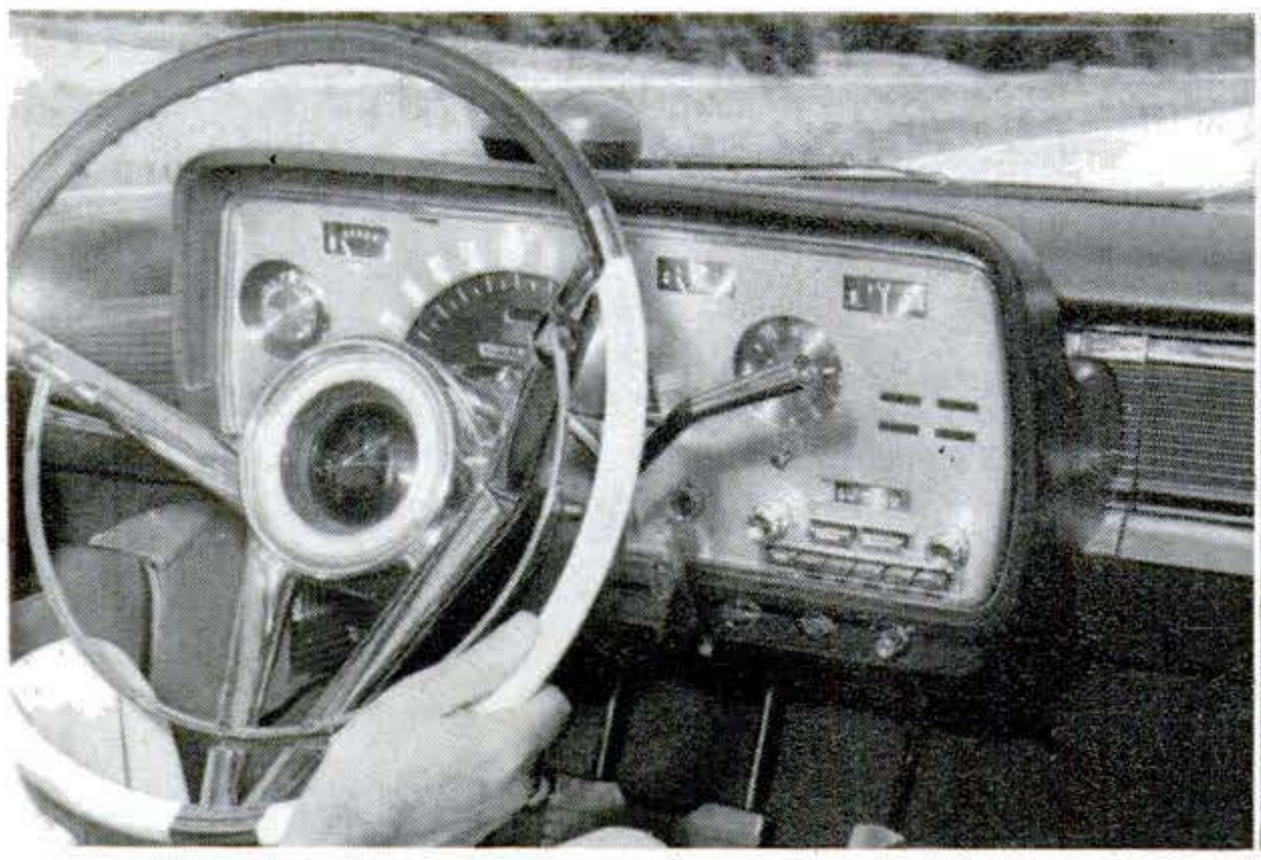
Coil-spring suspension all around was a necessary by-product of Lincoln's new type of construction. There's no frame to anchor semi-elliptics in the rear. Optional air bags as substitutes for coil springs will be available later.

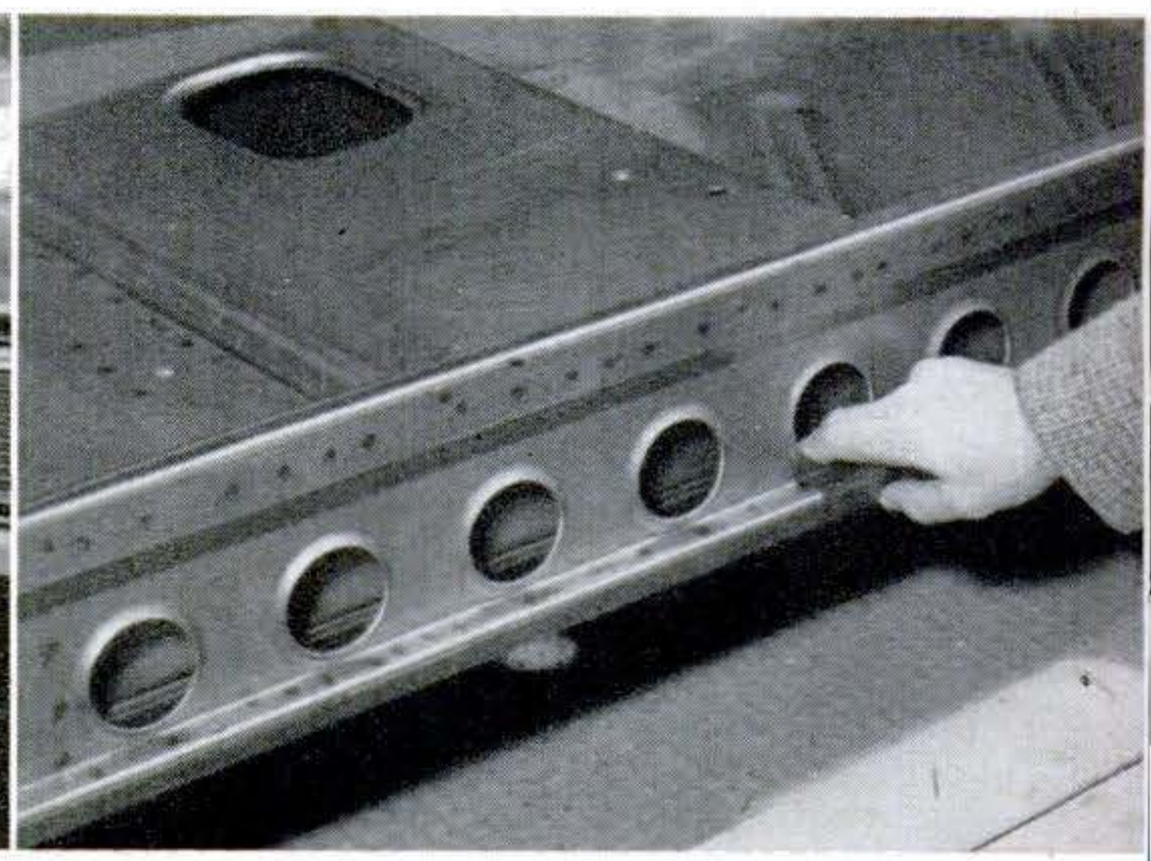
The nature of the suspension (see drawing) and torque transmission have a brace of happy by-products. Rear-end squat in fast starts and front-end pitch in braking are just about gone. Axle wind-up hardly exists. And despite its weight and size, the vehicle corners like an MG.

"We started out," said Kurt Hoffman, executive engineer, "under instructions to create a boulevard ride. The fact that we've got a sports car just happened."

The Lincoln's new engine is—you guessed it—right from the same block as

[*Continued on page 248*]





INSTRUMENT CLUSTER is in a special pod (left) jutting out from cowl. A back cover can be removed in a jiffy to service the wiring. The car's body metal is holed through at various points (right) to create different vibration frequencies, prevent drumming from road shocks.

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For complete rust-proofing, entire body is immersed in 10,000-gallon tank of primer paint.

ONLY OUTWARD DISTINCTIONS between Continental (above) and Lincoln are a reverse-slanted, retractable rear window (left), plus a latticed grille and back panel and different tail-light (right). For the first time, Continental has a "series"—with hardtops and a convertible.

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The Independents:

Engineered for Economy

Does everybody want a rolling palace with a herd of horses under the hood? These makers are betting the answer is No!

FOR 1958 the "independent" auto makers have reached a momentous decision. American Motors and Studebaker-Packard are putting all—or nearly all—their chips on a bet that the U. S. market for smaller, less flossy, cheaper-to-run cars is growing fast.

American Motors, burning its bridges in the big-car field, has unsentimentally killed off two ancient and honorable names: Nash (born in 1917) and Hudson (1909). A car called the Ambassador (now about the size of Ford, Chevy, Plymouth) will still be made, but the big sales pitch will acclaim the Rambler's solid virtues.

Studebaker-Packard is keeping the Packard name alive on a smaller car that reveals an unmistakable kinship to Studebaker. The Commander and President, as well as the Hawk sports coupes, will continue on the assembly line in limited numbers. But S-P is going all-out to promote its 101-hp. Champion and austere Scotsman.

The reason is simple: The independents' bigger cars have not been selling; their smaller cars have been ringing the register loud and clear.

Here's what American Motors and Studebaker-Packard have done to make their economy contenders more formidable competitors for 1958:

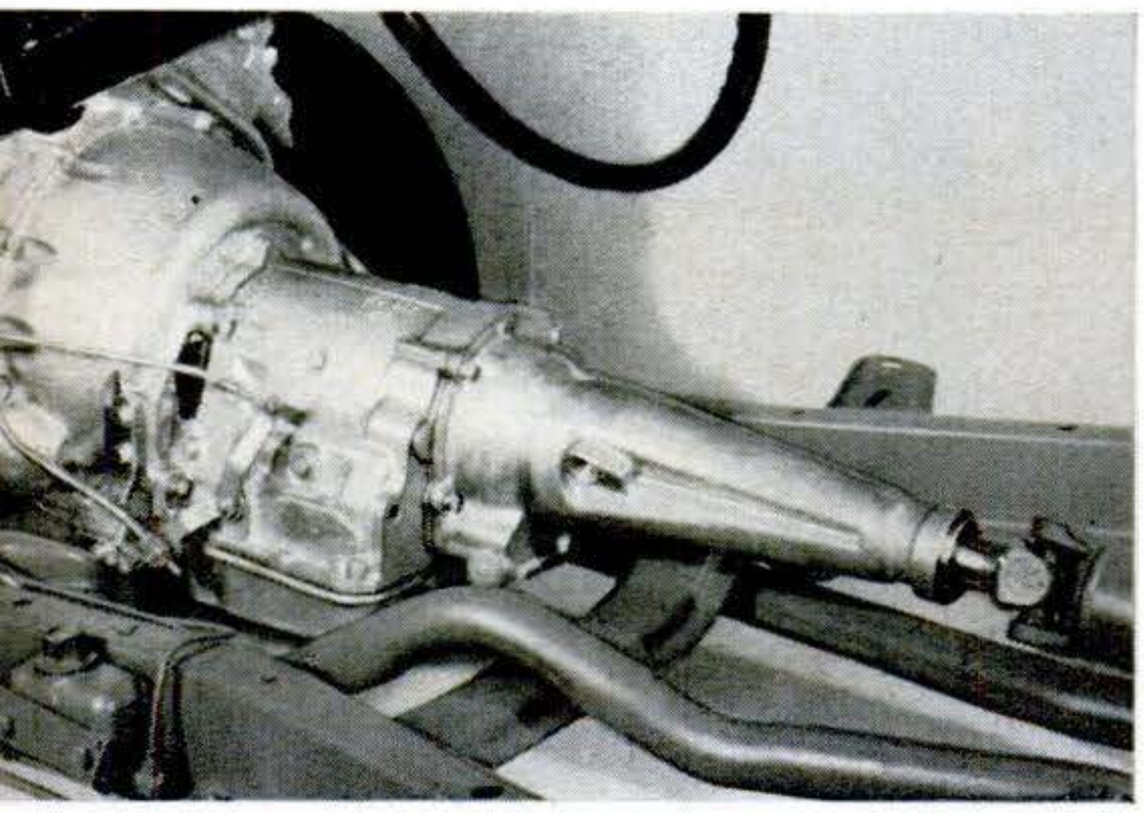
Rambler. Some of the gingerbread has been peeled off the Rambler's styling. It looks sleeker and longer, though it isn't. There are 12 body styles, including hardtops and station wagons. Seats are lower,

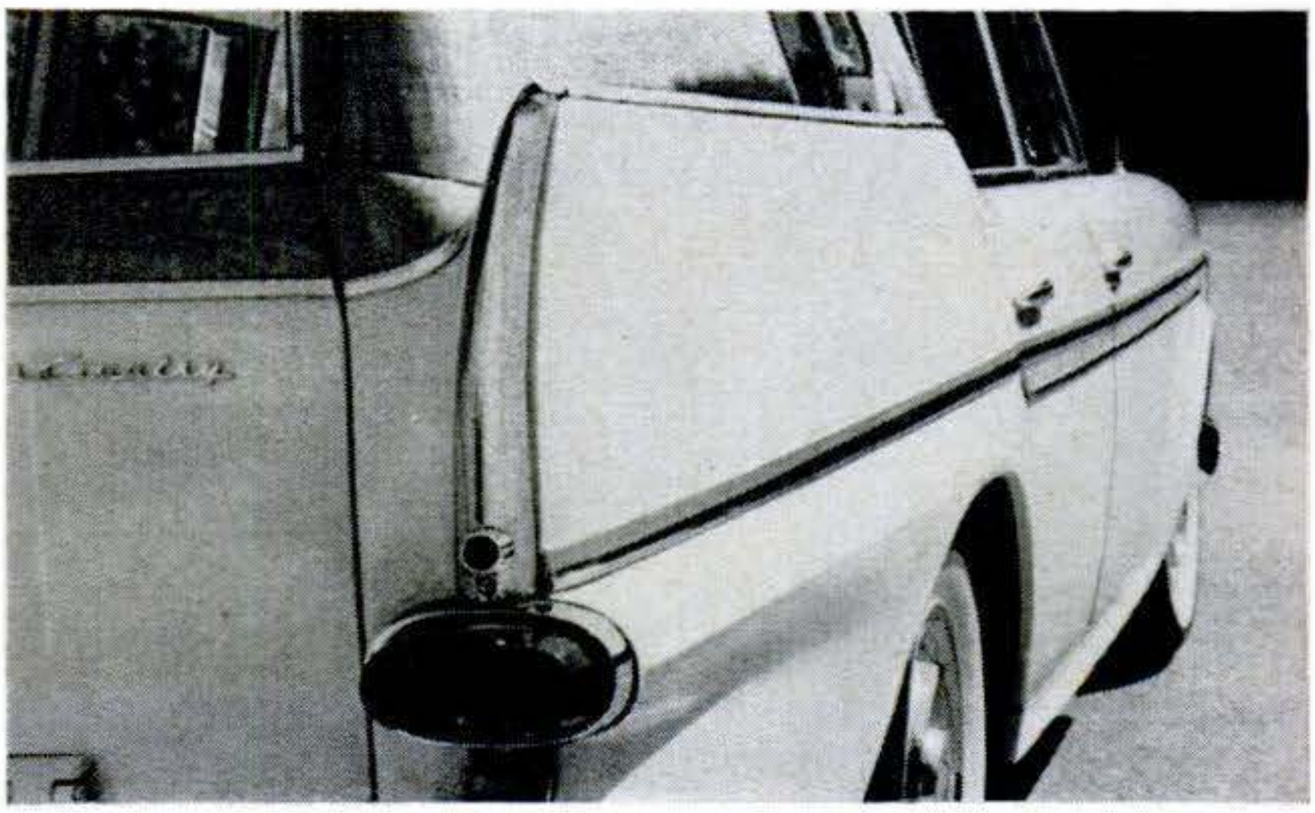
CHAMPION

TWO HEADLIGHTS are standard, four optional, on Champion. Longer transmission snout (below) helped get rid of two-piece prop shaft.

RAMBLER

RAMBLER WAGON with flared fins (below) comes in three horsepowers—sixes rated at either 127 or 138, and a tidy V-8 rated at 215.





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SCOTSMAN

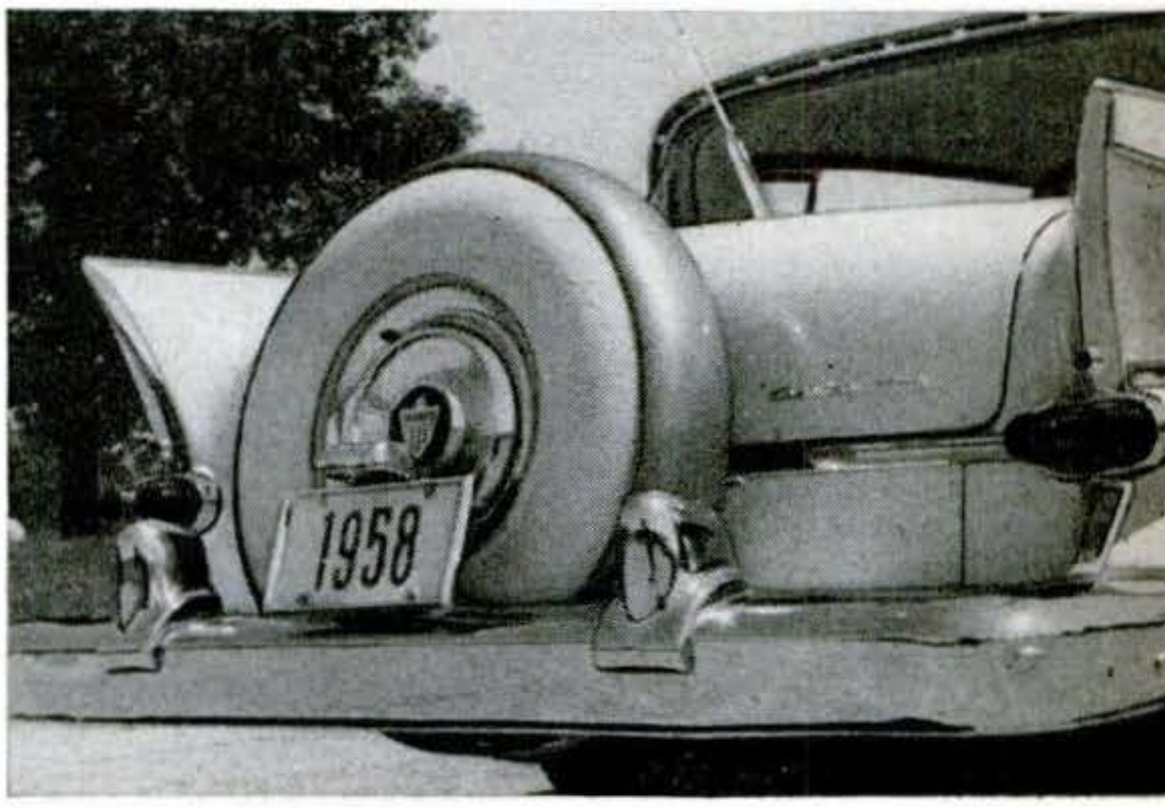
New egg-crate grille is most obvious change in the Scotsman, Studebaker's low-cost item.

PACKARD

PACKARD HAWK is a spanking new model with reinforced-plastic hood and weatherproof interior trim (below) that extends past window.

AMBASSADOR

AMBASSADOR LINE, to include a wagon, is new. Features: 117-inch wheelbase with 270-hp. V-8, finned fenders (below), Continental spare.



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and are raked back for less erect posture.

Just in case the Rambler prospect hasn't been entirely weaned from his Big Three tastes, the company is prepared to offer a bundle of comforts: a pushbutton automatic transmission (made by Borg-Warner); a pedal-applied parking brake; dual headlights; a 215-horsepower V-8; a recirculating-ball steering gear; a transistorized radio; an anti-spin differential; and air conditioning.

And gosh all fishhooks—tail fins!

To the customer shopping Automobile Row, Rambler salesmen are primed to cite that it's 18 inches shorter than a Ford, Chevrolet or Plymouth, is easier to park, and still holds six persons. The six-cylinder version of the Rambler goes so far on a gallon that it was finally barred from the Mobilgas Economy Run. Unfair competition.

Late this year American Motors is going to revive the 100-inch-wheelbase Rambler it made for a few years and then dropped. The present 108-inch version will be kept on, too.

Like Lincoln (p. 114), American Motors has taken to baptizing its bodies in a primer paint bath. The idea is that immersion, unlike spraying, can get primer to every point where rust might attack.

Studebaker Champion. Still clinging for dear life to that 101 horsepower (and 20-odd miles to a gallon of gas) at a time when anything less than 250 horses is a downright disgrace, the Champion goes on and on like the wonderful one-hoss shay. But a lot of changes have been made in the 1958 model. The car is lower. It has a new grille, new hood, new moldings, and different two-tone treatment. There's more leg room in back.

To maintain headroom in the rear, the floor pan was dropped more than two inches under the rear seat. They got this by lengthening the snout on the transmission. The longer, canted connection reduced the height of the prop shaft. It also eliminated some vibration in the whole propulsion train by doing away with that third universal joint that formerly broke the shaft in the middle.

The Scotsman. The news about this vehicle for the thrifty has Studebaker men walking around mumbling happily to themselves. Announced on the threshold of summer, the first cars off the line were gobbled up like oatmeal in Edinburgh. By July 15, the 1957-model-year production was sold out.

For 1958 the company will more than double the output of Scotsmen that it was thinking about last spring. Don't ask for actual figures. General Motors, Ford and Chrysler would give their eyeteeth to find out.

As befits a car built to save a nickel here and a dime there, the Scotsman has undergone little change for '58. The tail lights and grille are new. So is the lower panel of the front bumper. Cloth replaces woven fiber in the roof lining. The car has two headlights, not four. Unlike the rest of the Studebakers and the Packards, it has no fins.

One dealer sold more Scotsmen than he could get from the factory simply by collecting affidavits from owners that they were getting 23 to 30 miles to the gallon. Among others, a long-time Studebaker fan bought one—Mrs. Eleanor Roosevelt.

The purchase price for either sedan or station wagon remains, of course, the lowest among American-made automobiles. Even Studebaker itself is confounded by the popularity of the wagons. The management figured last spring that 20 percent of the Scotsmen sold would be wagons. The actual total is double.

Something else has Studebaker crowing happily. Of the trade-ins on the Scotsman, only four out of 10 have been Studebakers. Of the remaining six, half were Chevrolets, Fords and Plymouths.

American Motors and Studebaker-Packard have a warm, secure feeling about their economy products. They figure that the Big Three—Chrysler Corp., Ford Motor and General Motors—can't afford to produce economy cars because they'd hack into the sales of their regular lines. Moreover, reason the independents, this would prejudice the sales of used cars, and dealers must move used cars to live. As the independents see it, Ford and GM are doing the next-best thing by importing economy cars from Europe in limited numbers.

Just how many motorists, out of the 6,000,000-odd who buy new cars each year, are plunking down their money on economy cars, domestic and foreign, nobody knows. Comparatively, the number isn't big as yet. Will it snowball into a major market? That's what the independents are gambling on. END

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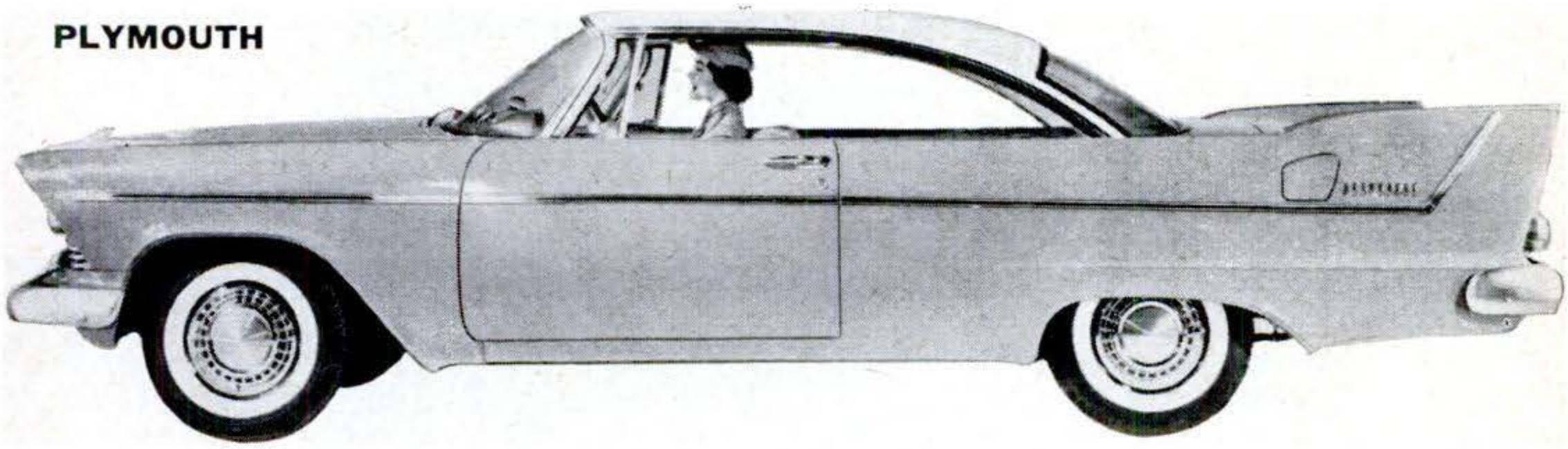
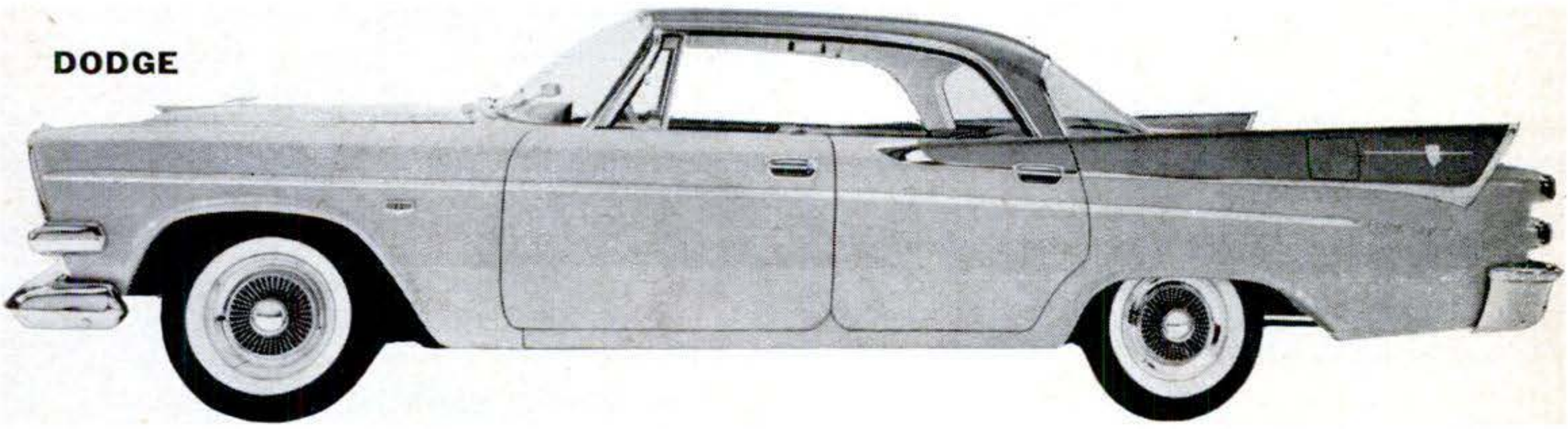
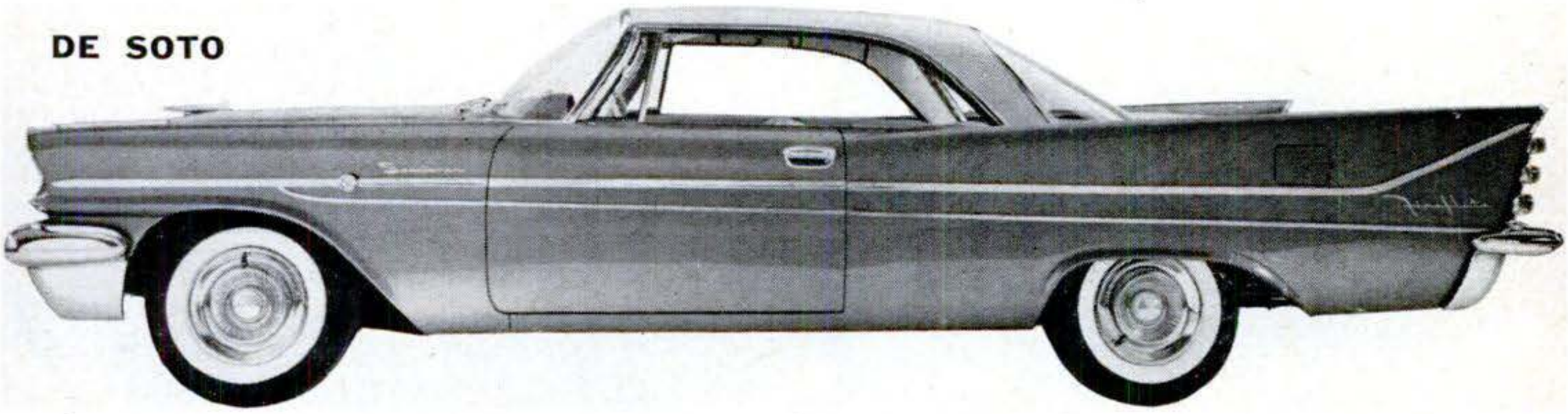
Chrysler Family: New Engines, Fuel Injection



A new V-8 engine, three-speed automatic transmission, provide a shot of getaway benzedrine.



Fuel injection is an option, and a new safety fluid practically eliminates brake fade.



A new power-steering unit, no longer protruding aft of the fire wall, self-centers better.

WHEN the Chrysler Corporation took the wraps off its 1958 cars late last month, they also unveiled a chrome-plated question: If a manufacturer has a good thing, should he run the risk of changing it much?

The 1957 Chrysler line cars certainly *were* a collection of good things. They changed the tail fin from a bit of French poodle ornamentation to a symbol of advanced styling. They made a virtue of car heights that made you stoop to enter. And—the payoff—they sold. The Plymouth, in particular, sold. It shellacked

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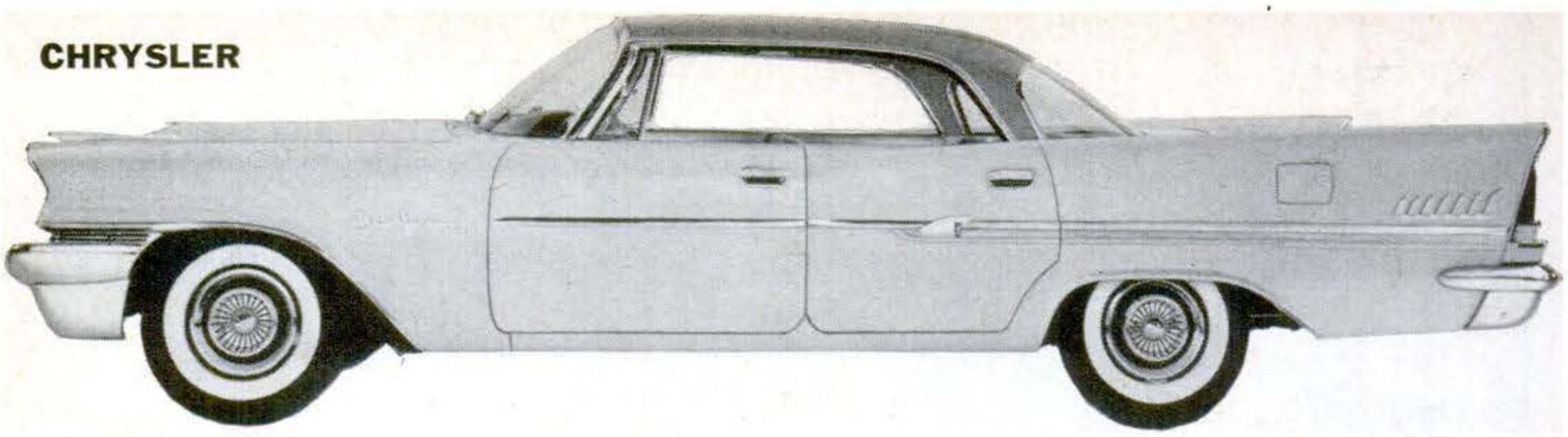


The New Yorker's stainless-steel side molding incorporates an identifying gold medallion.

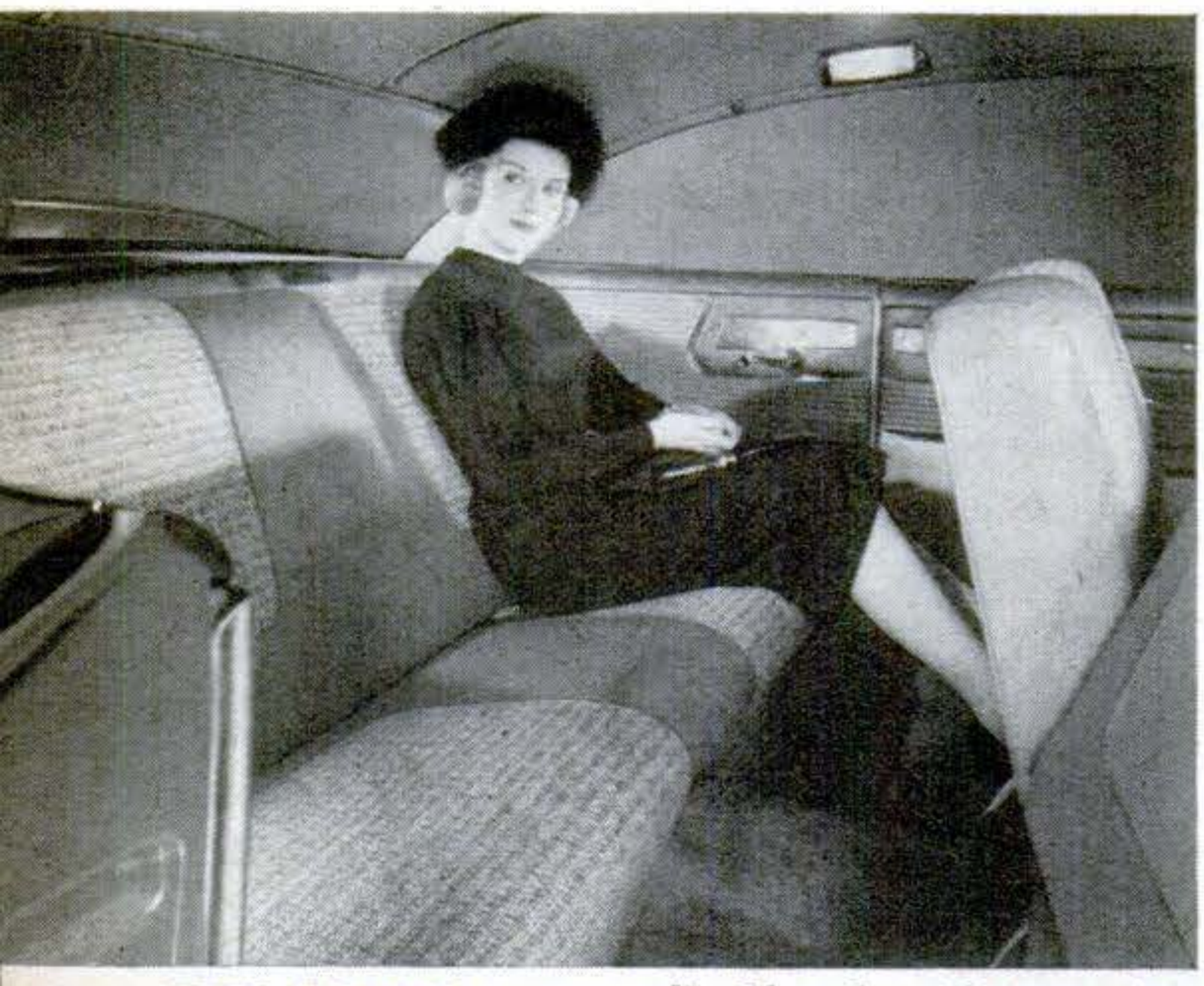
the Buick, previously in third place in popularity, for fair.

The Plymouth for '58, as with the rest of the corporation's lines, has received no radical changes. Still, plenty has happened to it:

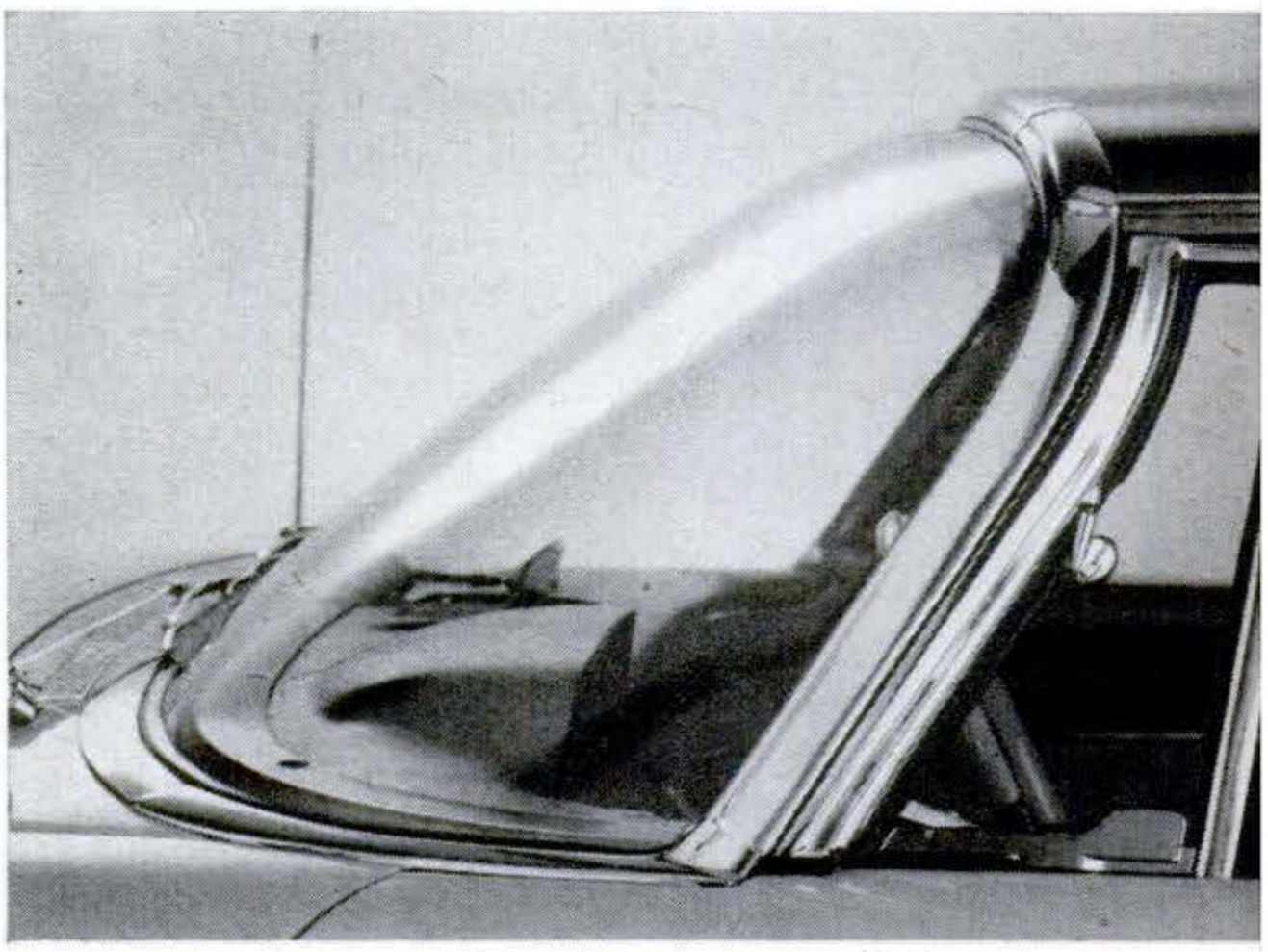
- Dual headlights in each fender, a new treatment on the tail lights, replacement of the choo-choo lower grille by horizontal bars; new fender ornaments; new wheel covers.
- An increased use of tinted or polished aluminum for outside trim, such as that outlining the tail lights and insetting the rear fender on the Belvedere series.
- A new steering wheel; rear-view mirror relocated for better visibility.
- A reduced radius on the curve of the back-seat cushion for more entrance room, and a seat construction that gives more back-seat foot room.
- A new V-8 engine of 350 cubic inches [PS, Oct.], strictly optional, is available on all models, all series. The Bendix fuel-injection system [PS, Mar.], also strictly optional, can be had on this engine, if you've got the money. The standard installation is an engine of one displacement, 318 cubic inches, for all V-8 Plymouths—instead of last year's stepped-down sizes for stepped-down prices. Differences are confined to carburetion, camshafts, exhausts. The flathead six is unchanged.
- A three-speed automatic box on all cars instead of on the Belvedere only—optional, of course.
- A lighter, more compact power-steering unit.
- One more leaf in the rear springs.

Dodge, De Soto, Chrysler, Imperial—the rest of the Chrysler Corporation stable—share with Plymouth some ornamentation and engineering changes.

Anodized-aluminum extrusions have been used here and there. Hardtops in the Dodge, Chrysler and De Soto, and in all models of the Imperial, have double-



NEW FABRICS grace all Chrysler Corporation cars, and rear-window defrosters are optional.



DOUBLE-WRAP WINDSHIELDS come on all Imperials, and on Dodge, Chrysler, De Soto hardtops.

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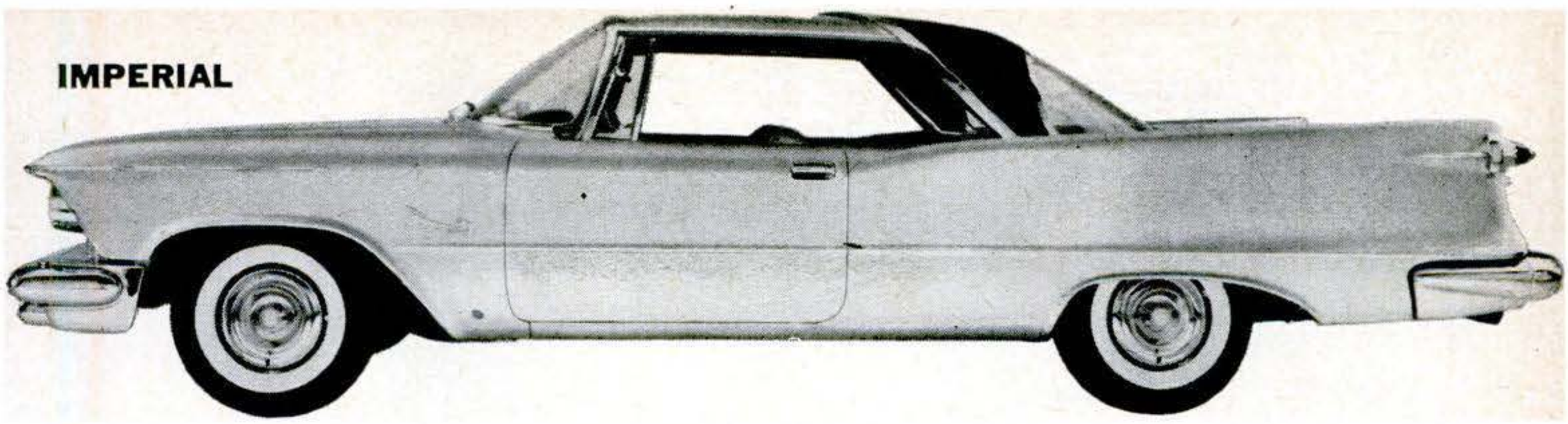


The engine has more power, and a limited-slip differential gives footing in mud or snow.

wrap (or pompadour) windshields, expanding the glass area by 10 percent.

A new power-steering unit, lighter and more compact, has been designed. It's all snugged in at the base of the steering column without this year's protrusion into the passenger compartment. It's a bit more self-centering. The corporation in 1957 sold power steering faster than the things could be built. Plymouth alone installed 140,000—five times as many as in 1956.

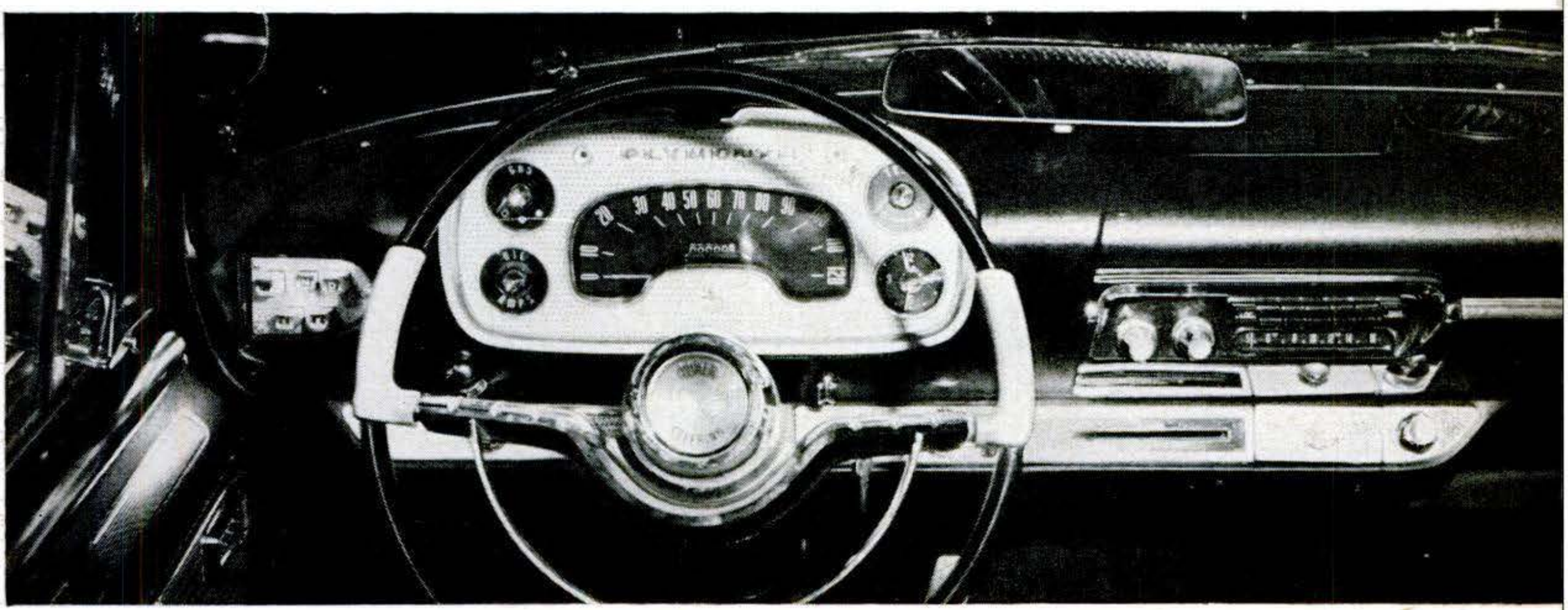
Except for those cars on which the new "B" engine is available as standard equipment or an option, power-plant displacements, compression ratios and horsepowers remain substantially the same. The biggest of the corporation's engines is the 392-cubic-inch job for the New Yorker and Imperial. That it's unchanged may in itself be a commentary on an ebbing "horsepower race."

Fuel injection is available on all Dodges (as well as Plymouths), but in the De Soto only on the Adventurer—the opposite number to Plymouth's Fury and Dodge's 500—and in the Chrysler only on the 300-D. Imperial sticks to carburetors.

A limited-slip differential is offered by Chrysler Corp. for the first time. It's similar to a conventional differential except for friction plates that clutch the differential case to the axle shafts. The system has four pinion gears in place of one.

There's a new safety brake fluid with a minimum boiling point of 400 degrees F., higher by 100 degrees than most present-day fluids. The corporation says it practically eliminates brake fade from vaporization of the fluid.

The Chrysler management will be standing first on one foot and then the other for the next two or three months waiting for the answer to the question: When you've got a good thing, should you change it much? END



NEW METAL TEXTURES brighten up the instrument panel. Rear-vision mirror, moved nearer and to the left from the center of the windshield molding, gives better visibility.

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Picture News
IN THE WORLD OF SCIENCE

World's first air-to-air atomic rocket is fired

SECONDS after the Genie missile at left was launched, its atomic warhead exploded 18,000 feet above Yucca Flat, Nev., with a bang equal to about 2,000 tons of TNT. The Douglas rocket was fired from a Northrop F-89J Scorpion. At top, right, is the crew, AF Captains Eric

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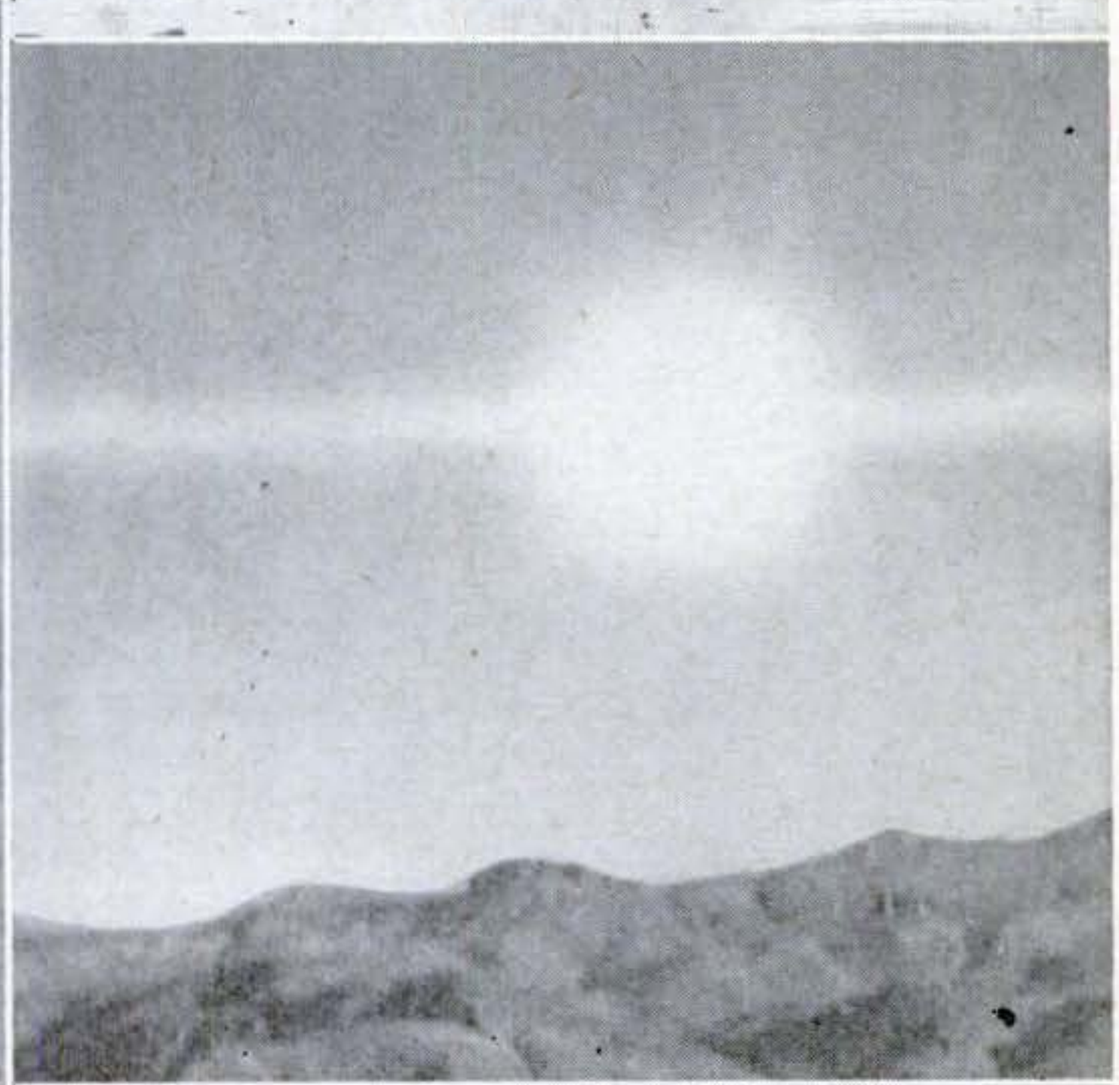

Hutchison, pilot, and Alfred Barbee, radar observer and weaponeer. Below them is the fireball, and at bottom five officers, wearing no protective clothing, who stood at Ground Zero during the blast, indicating that the MB-1's detonation involves no danger to people on the ground. But even a near miss could destroy a fleet of enemy bombers.

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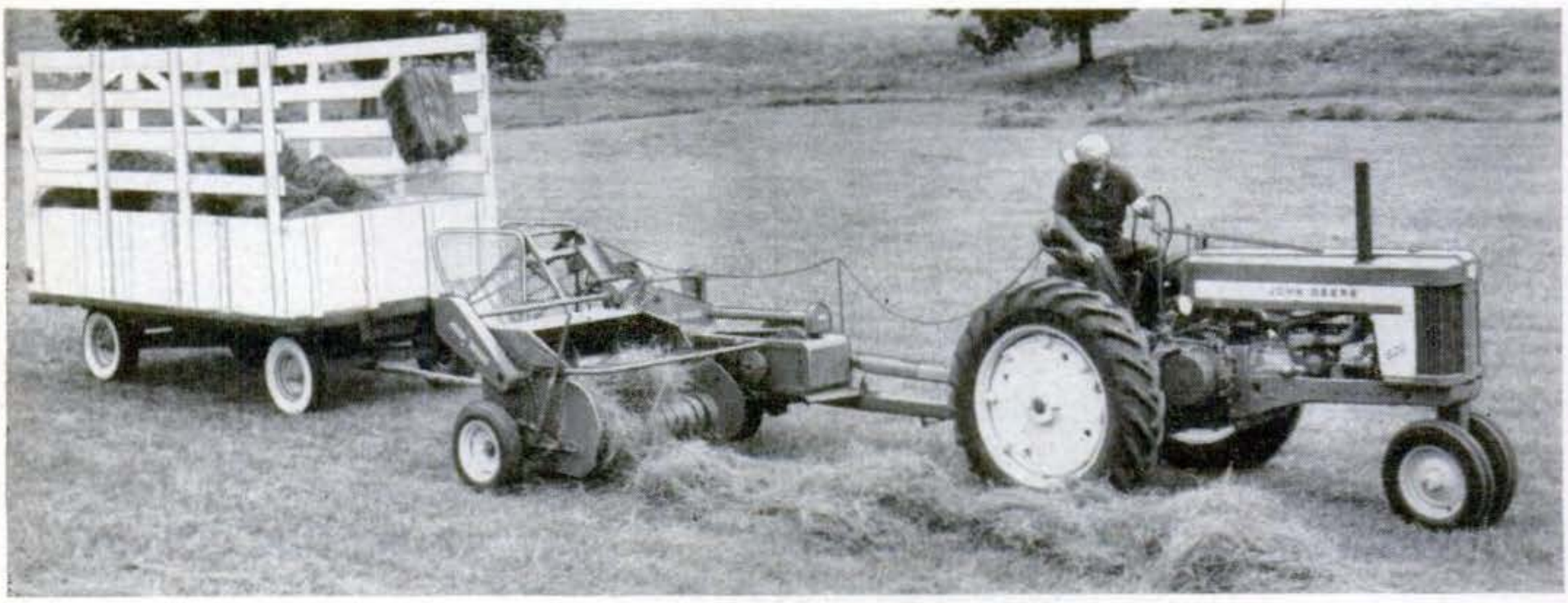
1958 Volkswagen gets more glass, new interior

A REAR window doubled in size, a narrow-post, wider-view windshield, and wipers sweeping more space are new on these 1958 VW's just received from Germany. Other changes: a new dash, U. S.-type gas pedal, improved brake leverage and synthetic-leather-covered doors.

Hay baler speeds up farm work by loading own trailer

THIS new one-man farm machine not only ties a field of mown hay into neat bales but tosses them automatically into the air, to drop into a wagon pulled along behind. Its makers, Deere & Co., Moline, Ill., say that the device cuts hay-storing labor in half.



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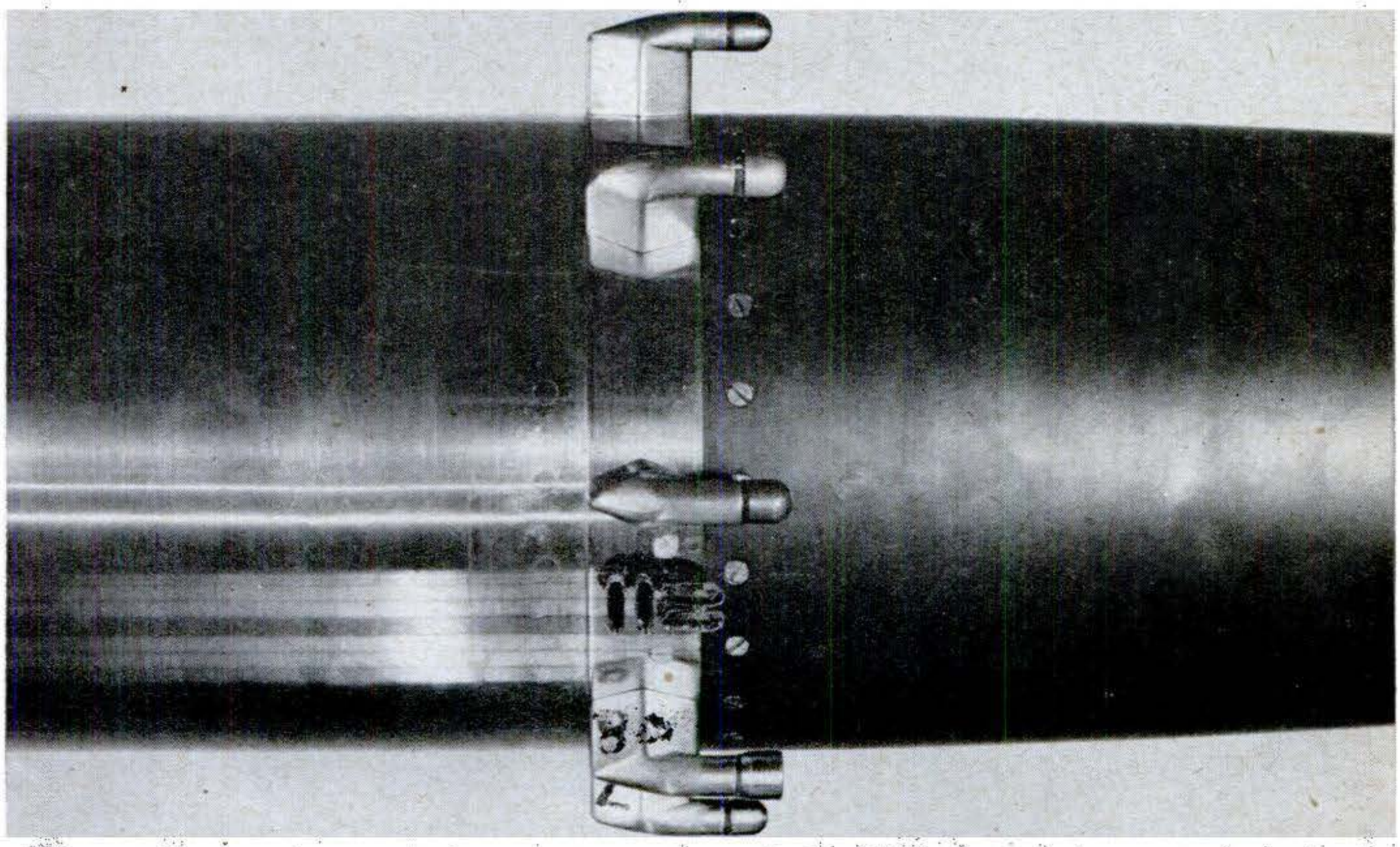
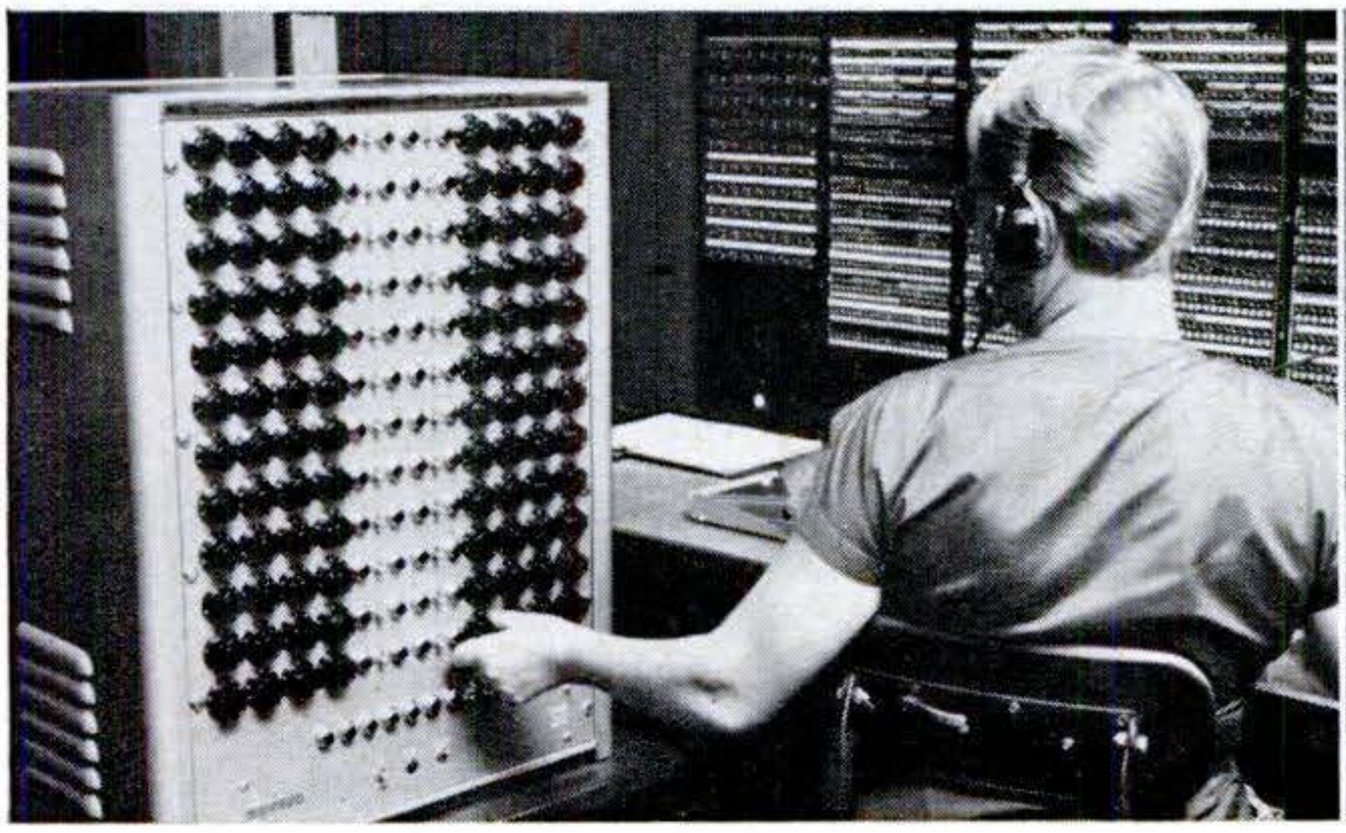


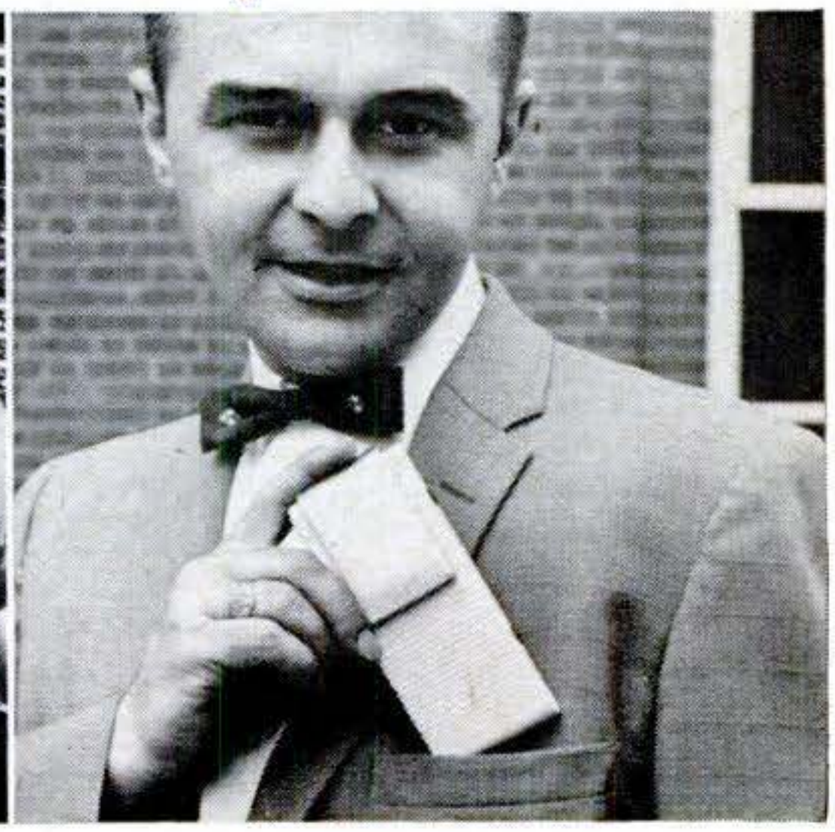
"Flying crucible" tests supersonic-missile metals

GIRDLED with sample-carrying probes, this experimental rocket helps scientists to compare the resistance of various metals and alloys to burning up when a supersonic missile meets the heat barrier. Test specimens, with round and flat faces, are attached as in the close-up.

Pocket radio calls you to phone eight miles away

A TINY transistor signal receiver that whistles when its coded frequency is tuned in is being tried by Pennsylvania Bell to notify salesmen and repairmen—as far as eight miles away—of phone calls. Unlike hospital-to-doctor service, it responds only to its own frequency.





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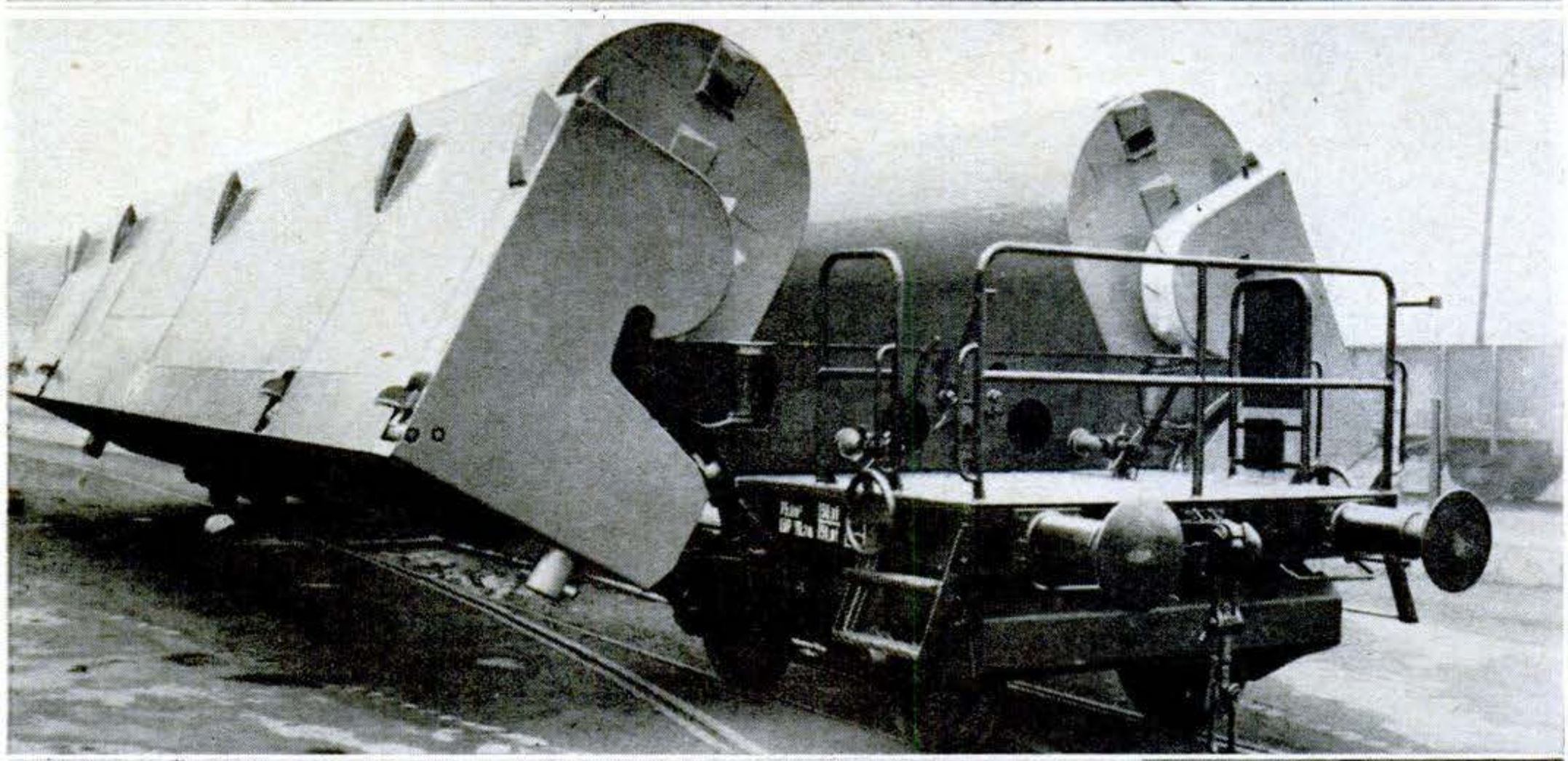

Side-dumping freight car takes to water, too

THIS hopper vehicle saves costly transshipment by doing double duty for its owners in Germany, where hauling coal, coke and ore often requires both rail and water transportation. Mounted on railroad tracks, the car splits down the middle to unload more than 50 tons of cargo at both sides of the track. Dismounted at a waterway, it becomes a barge.

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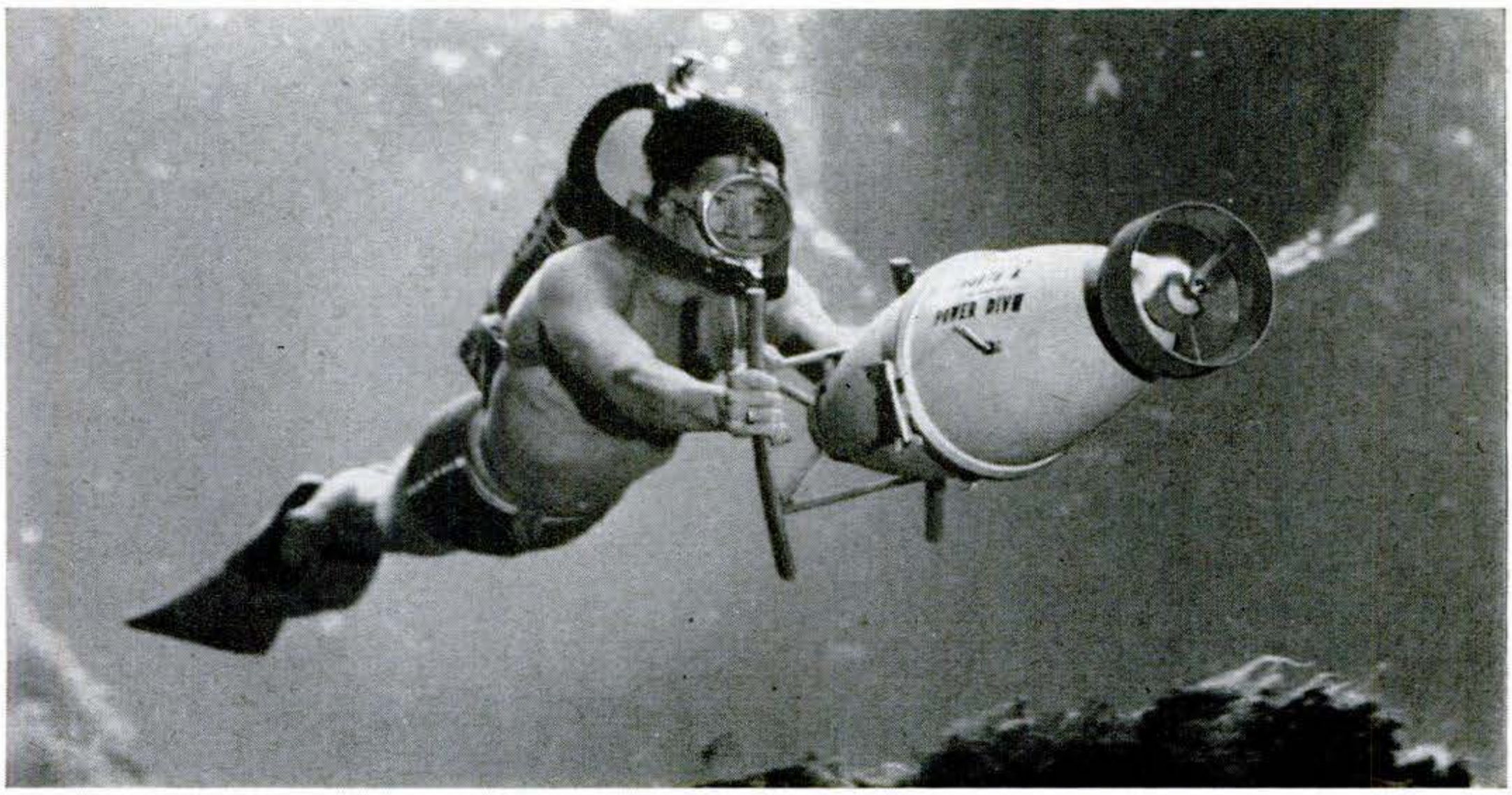
Baby satellite has ports to test solar batteries

A SIX-INCH satellite has been developed by the Naval Research Laboratory as a test vehicle to ride early Vanguard rockets before the bigger 20-inch "moon" is launched next year. Windows are housings for solar batteries that might supply power for later satellites.

Outboard power pack does swimming for skin diver

How to have fun under water without work is being demonstrated by this "fish man" at Silver Springs, Fla. The Bludworth Marine Power Diver he is steering is battery operated and enables him to climb, dive, bank and roll with fingertip control at depths to 180 feet.



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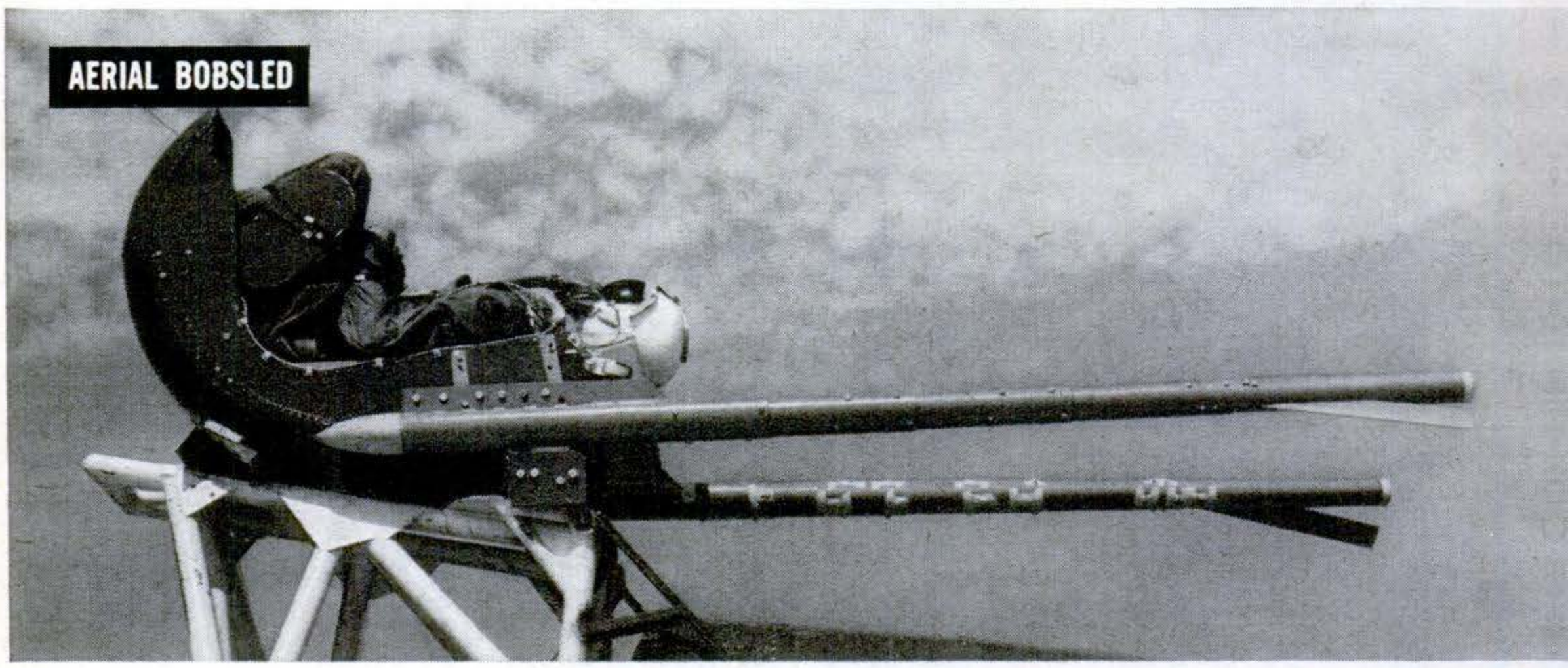
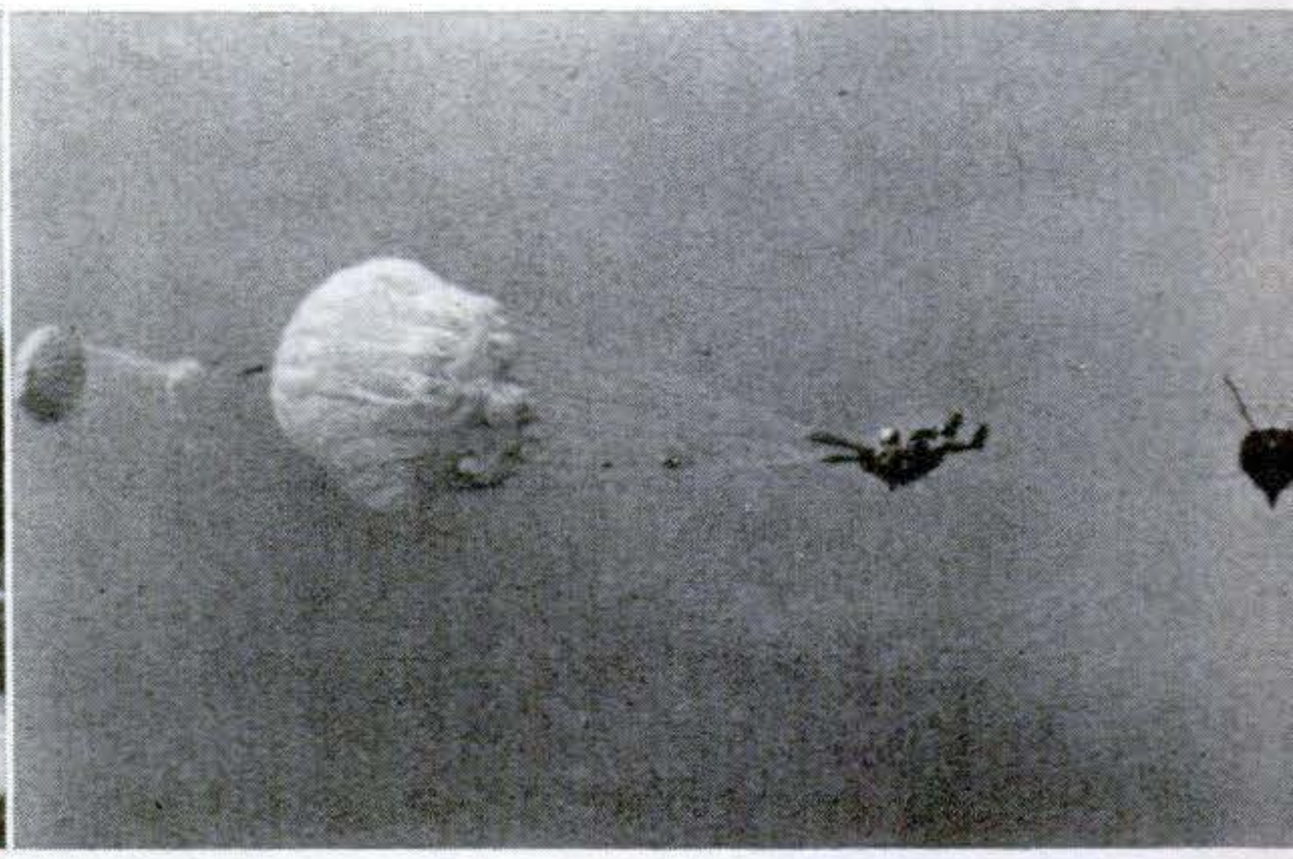
Three new ejection seats make jet flying safer

RAPID-FIRE bail-out of supersonic-bomber crews is sought with an ejection system designed for the three-man B-58 Hustler—world's fastest



. . . the dummy pilot in this second new bail-out seat are important in tests. In this seat, intended for supersonic fighters such as the Convair F-102A, the pilot is ejected prone and then propelled feet first by an



. . . A third seat, built in Britain for safe bail-out from jets at low level, is the first of its type demonstrated in the U. S. with a human occupant. Here Flight Lieut. Sydney Hughes of the RAF is catapulted

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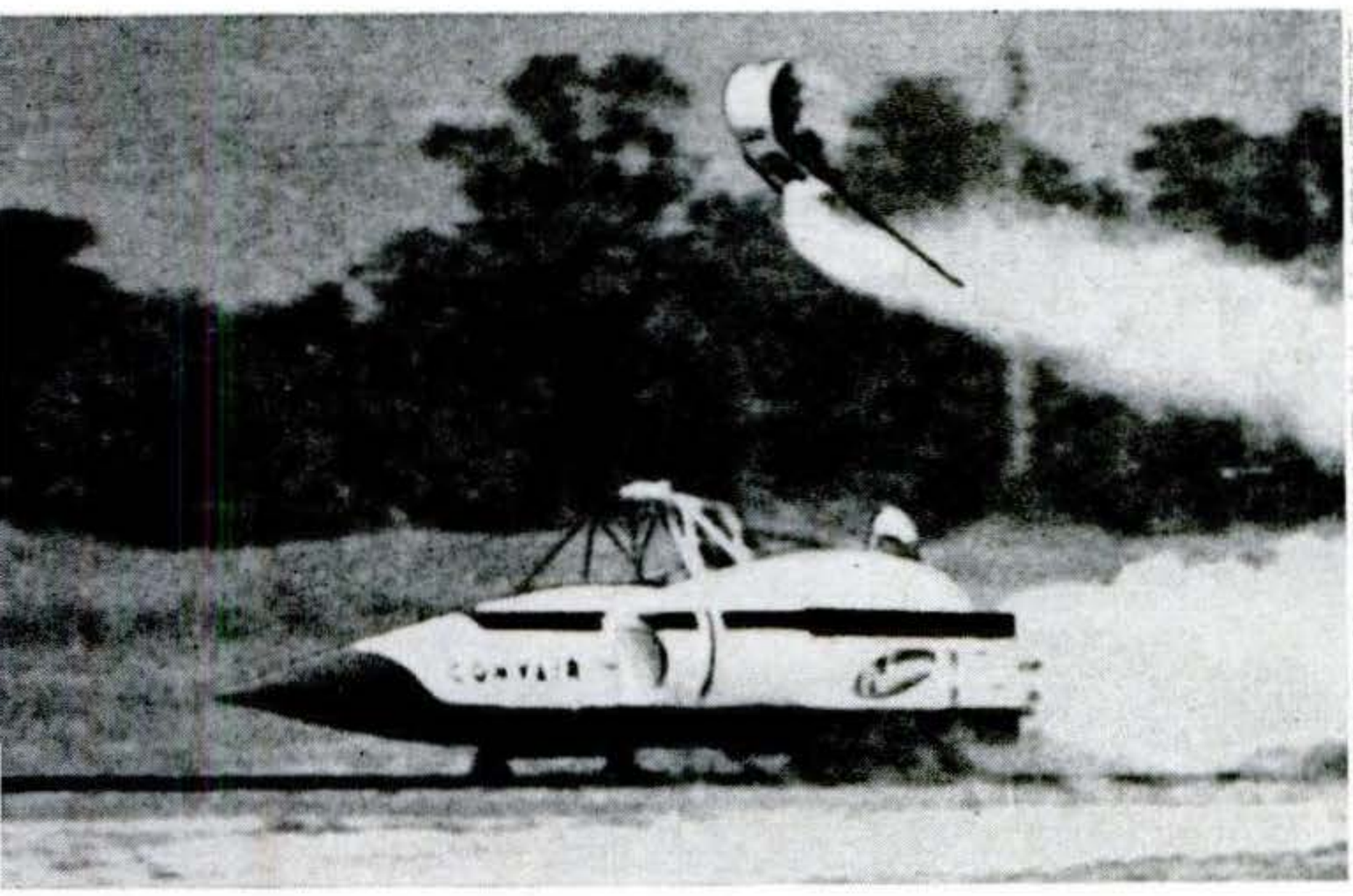
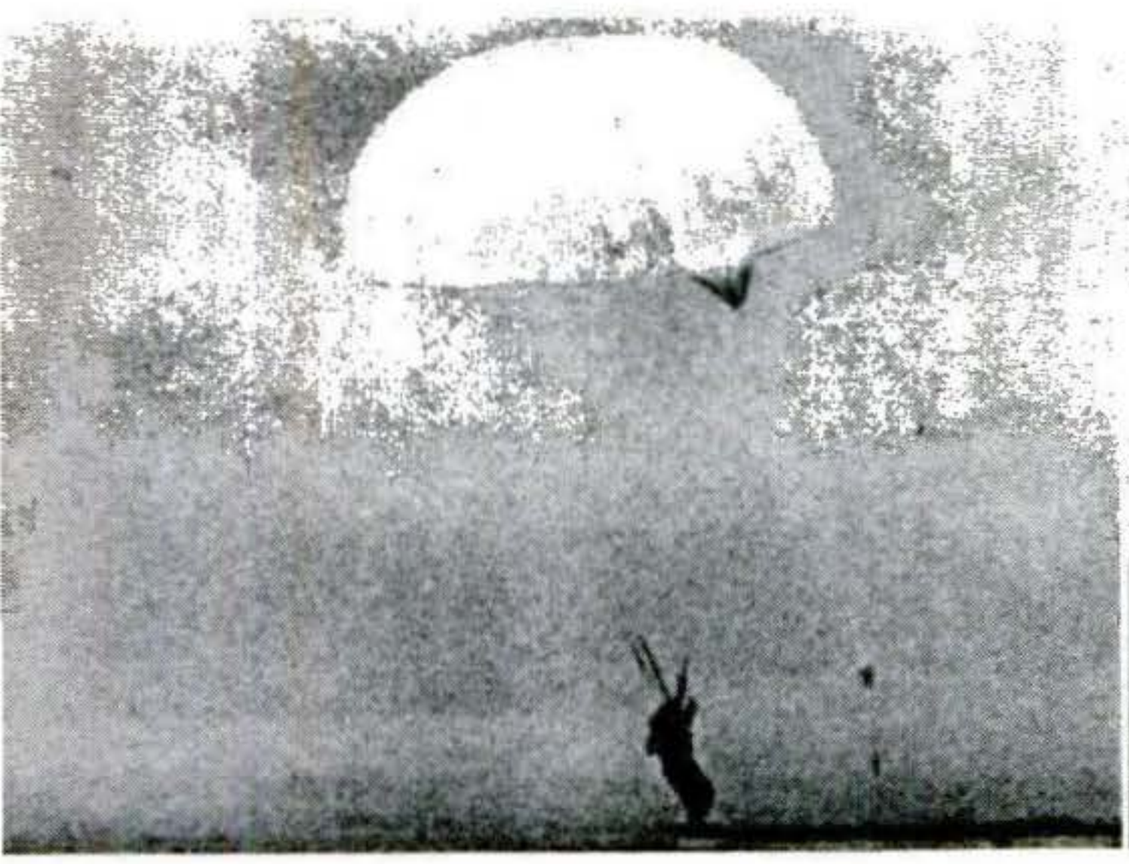
bomber. Tried out here on a rocket sled built like the Convair plane's nose, it ejects three dummies, one at a time, in the space of seconds while traveling faster than sound. Air-shock effects on these and . . .



automatically fired rocket. Twin finned booms, which telescope into the back of the seat when not in use, provide greater stability during hurl-out than previously used stub rudders and horizontal stabilizers . . .



from a Grumman F9F-8T on a runway. Next, he leaves the seat as his parachute opens. Then he starts his descent and finally (far right) lands in a roll. The U. S. Navy is adopting it for carrier-based jets.

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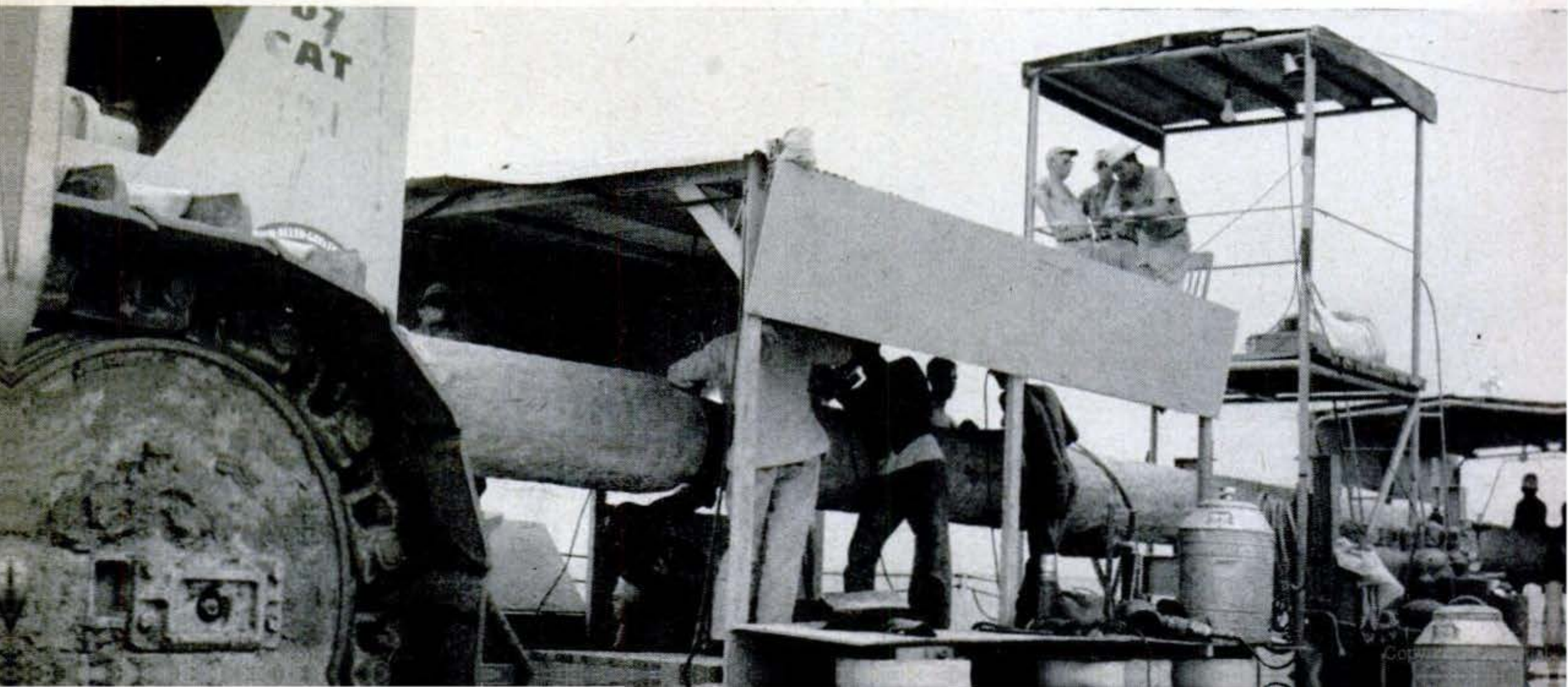
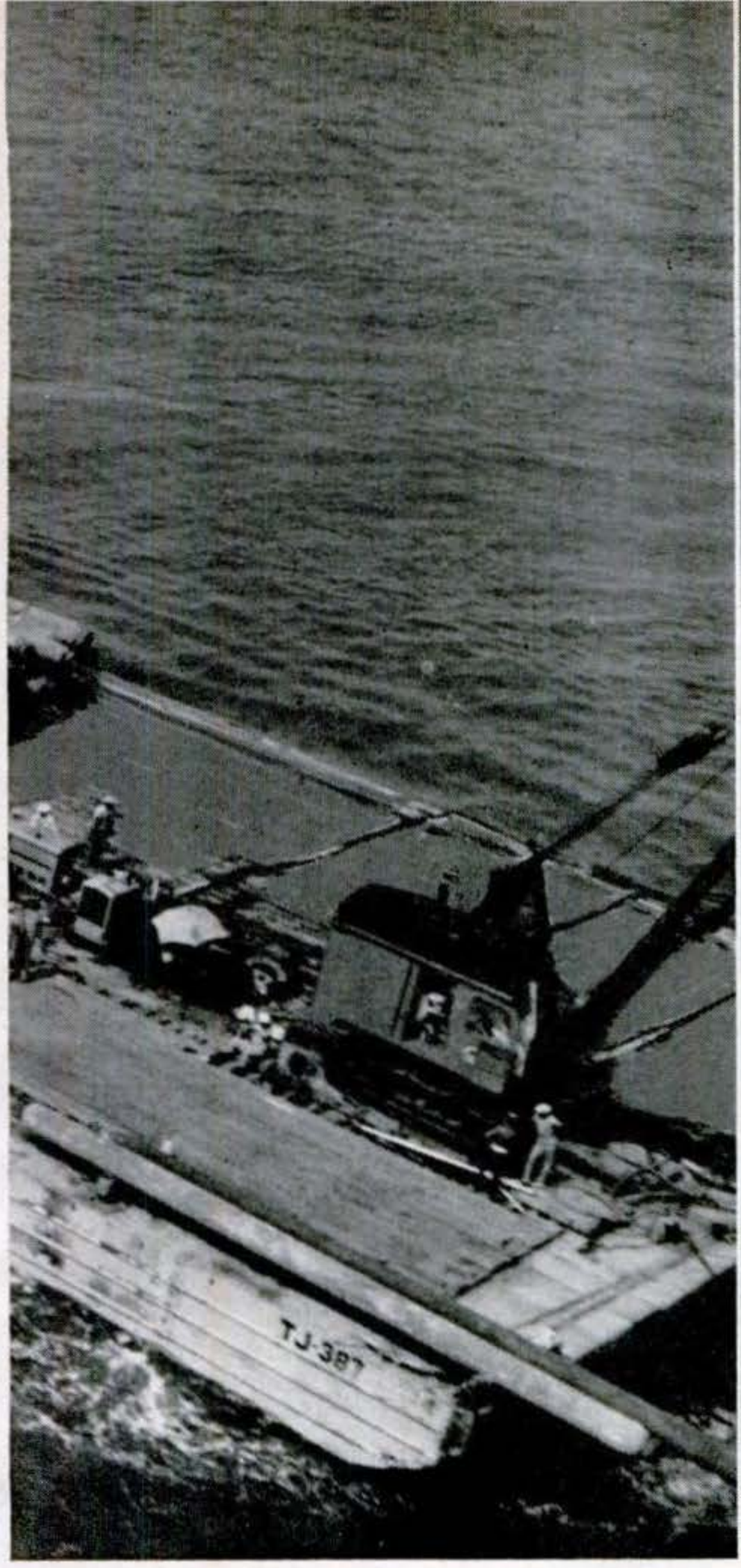
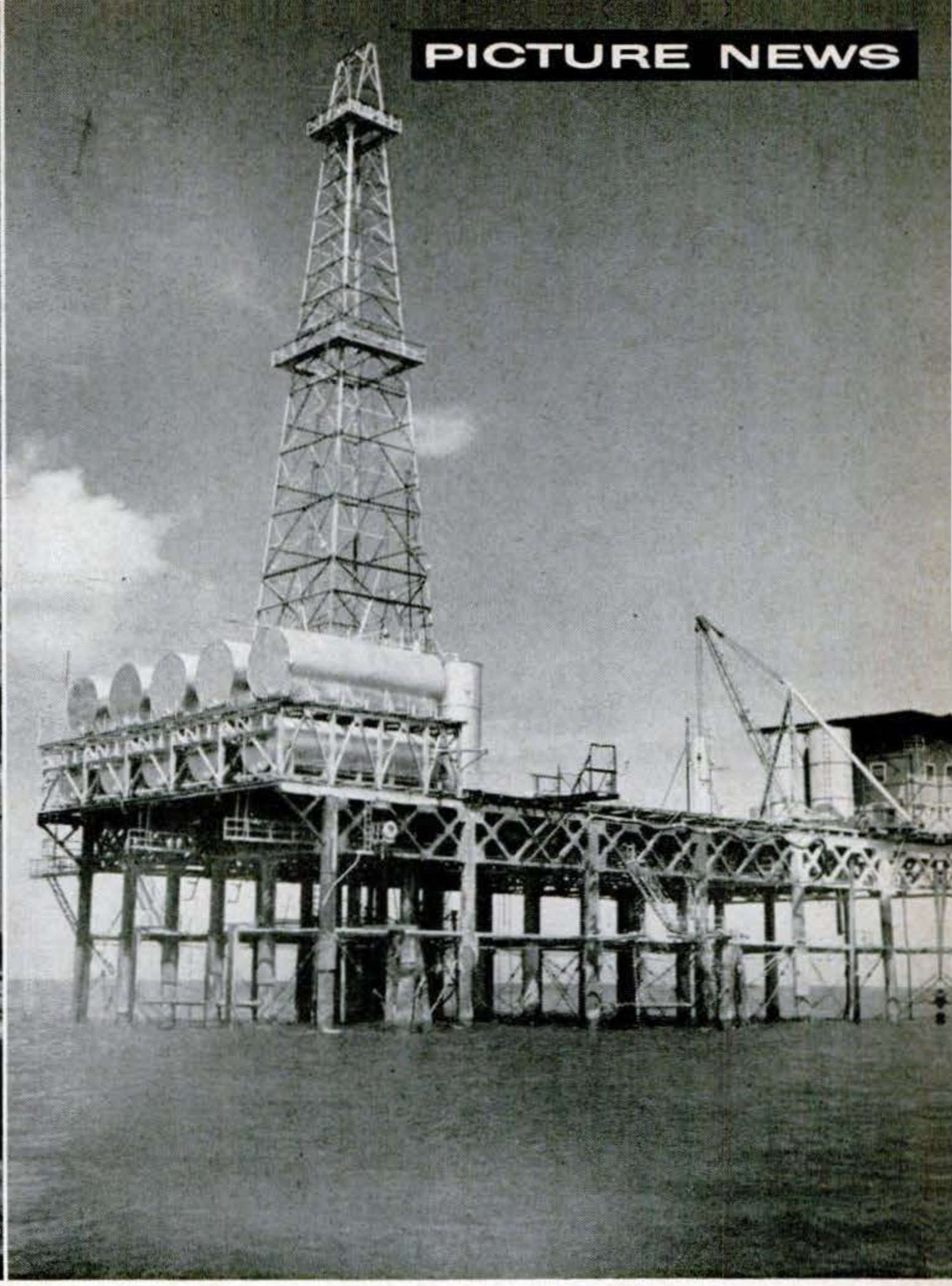
Floating ramp lays gas pipeline under Gulf waters

FROM a Louisiana beach to a gathering platform in the Gulf of Mexico offshore oil fields 7½ miles away, the first underwater natural-gas pipeline is being laid. When completed by Transcontinental Gas Pipe Line Corp., it will bring in gas for the New York-New Jersey-Philadelphia area. The big ramp barge (upper left) laying the line to the platform







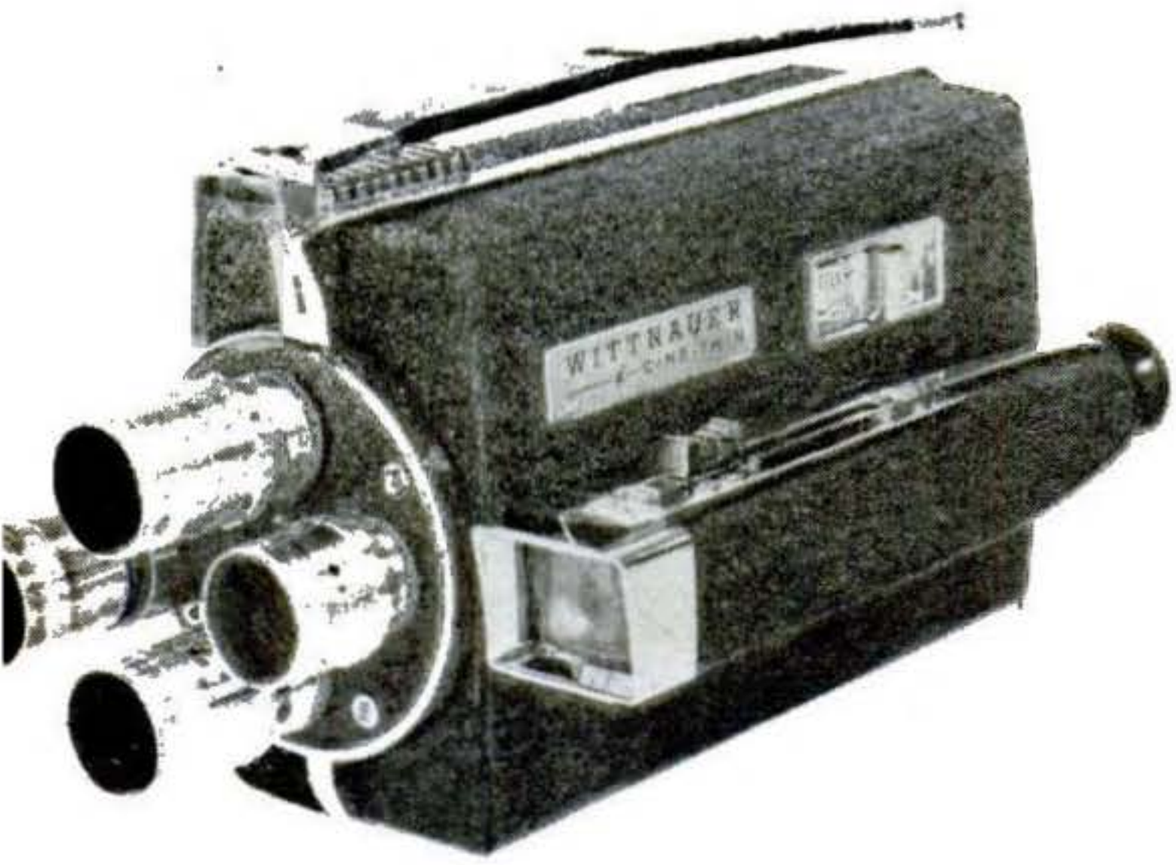
(right) is a floating production line. A 40-foot length of coated pipe is lifted by crane from another barge alongside, welded to the line (below, left), put through various re-weld and X-ray test stages and then taped and cemented at the joint (lower right). Meanwhile, the ramp is propelled forward, sliding the continuous line to the bottom, where it settles in a covered ditch dug by a powerful jet stream.

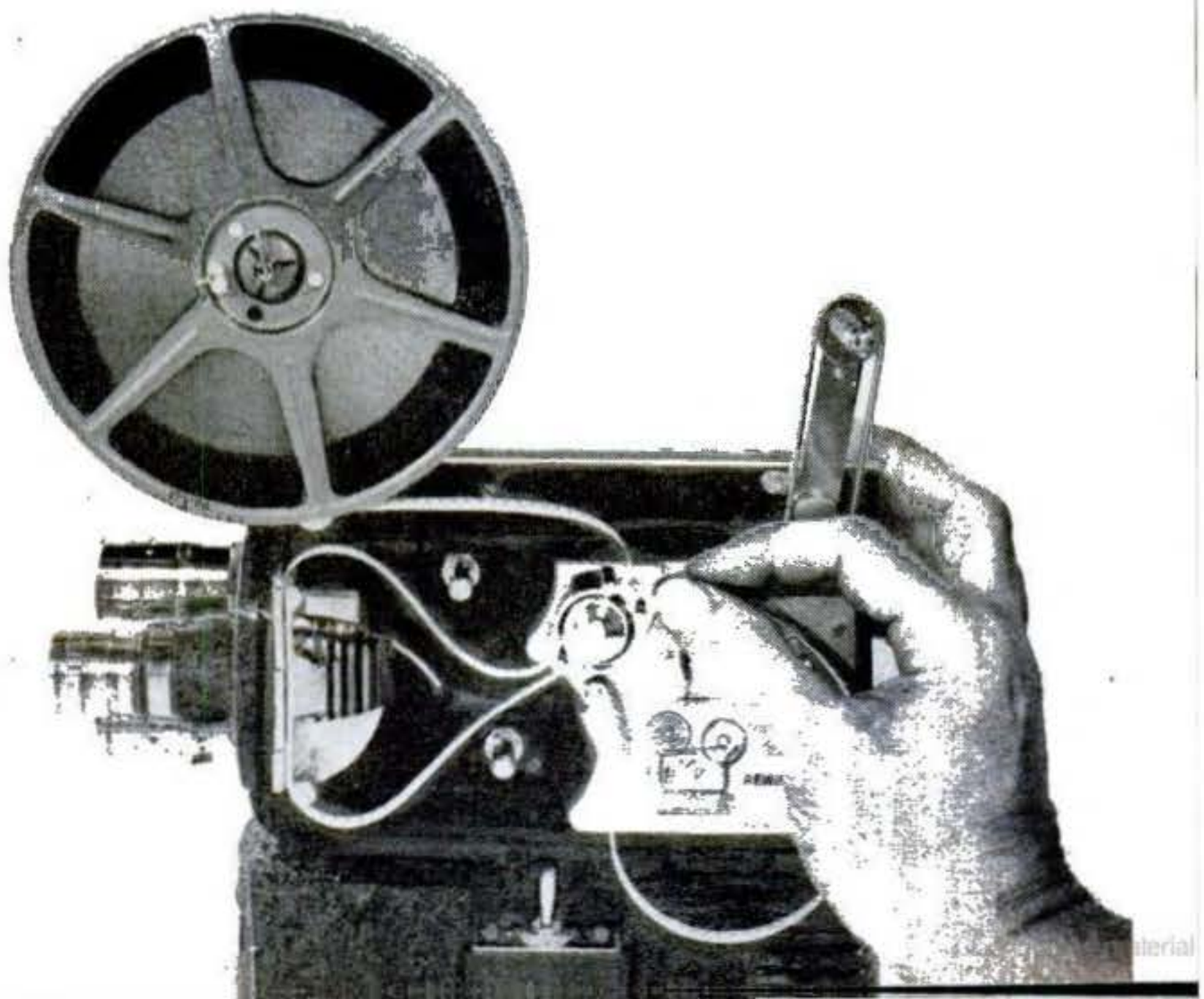
When do drivers get drowsy? Brain-wave tester tells

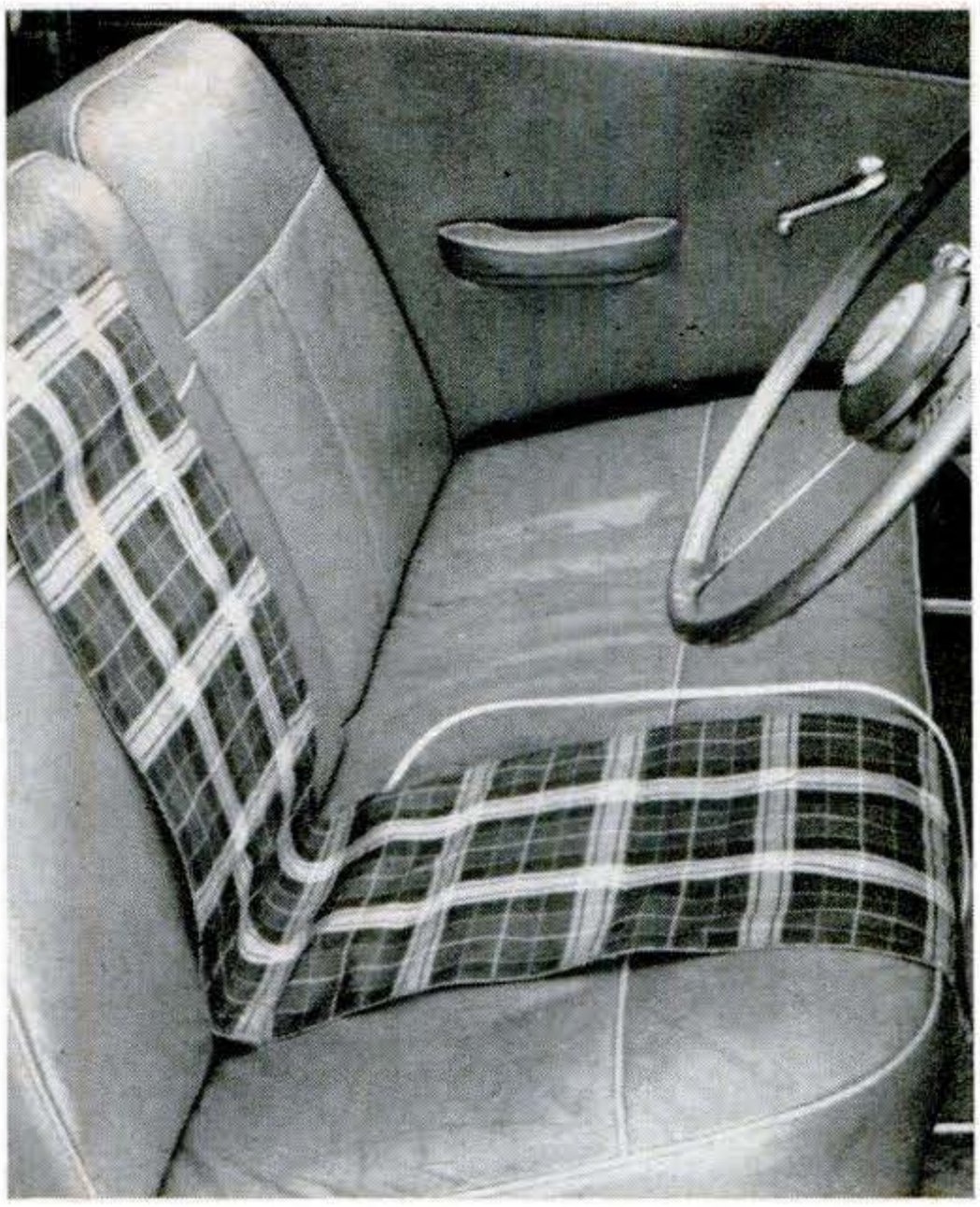
USING an electroencephalograph to record the brain waves of the operator of this motionless car, Chrysler engineers and experts at Detroit's Harper Hospital study driving fatigue. Tests, in an atmosphere of simulated traffic noises, show drowsiness after 1½ hours at the wheel.

New 8-mm. movie camera is a projector, too

TAKE the view-finder side off this camera, lock the body on a power-supply base, and it becomes a projector. It is made by Longines-Wittnauer Watch Co., which this month enters the photographic field. The 8-mm. movie camera is electrically driven, being powered by three flashlight cells when used as a camera and by house current when used as a projector. Cost: $159.50; telescopic and wide-angle lenses extra.







Hot seat warms cold driver

FOR cozy winter driving, this electric pad (on the right-side driver's seat of a British car) can be plugged into a six- or 12-volt circuit. Its two heating elements use about the same current as parking lights. Conway Car Accessories, Ltd., of London, handles the warming device.

Solar clock runs on light

EXPOSURE of the silicon cells atop this clock to the equivalent of a day's light—sun or incandescent—will run it for a month. Developed by General Time Corp., it contains a voltage accumulator that is charged by the solar cells and operates an electric clock mechanism.

Coal scoop is world's fastest

CAPABLE of emptying a 900-ton coal barge in just half an hour, this big multi-scoop conveyor is the world's fastest unloader. Made by Link-Belt Co., it feeds fuel to U. S. Steel's giant coke and chemical plant near Pittsburgh.

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This midget car uses sea-going parking lot

So HE will have land transportation ready at hand wherever he docks, William Plachter, a Philadelphia automobile dealer, parks his BMW Isetta on the foredeck of his 55-foot motor yacht. When he reaches port, he lowers a gangplank and rides off in the tiny car.

Phones at drive-in restaurant take orders on the run

PATRONS of this restaurant in Anaheim, Calif., place orders on the way in, pick them up at a delivery window. Food is cooked by microwave: chicken fried in 30 seconds. Don Nixon, the Vice President's brother, is operator. The place cost $430,000, can serve 27,000 a day.

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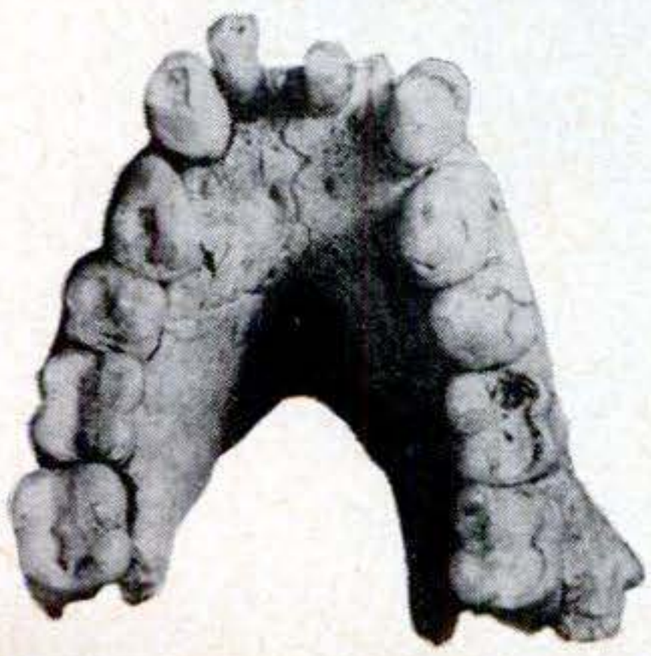

Prehistoric ape may have stood 15 feet high

RECENT discovery in China of a half-million-year-old ape jaw provides a new clue in the study of man's possible ancestry. The fossilized jaw (left) is curved like a man's and about twice the size. The ordinary ape jaw is elongated.

This reconstruction shows the ape, which Chinese scientists say may have stood 15 feet, with two Peking men and an orang-utan of its time. It was drawn for *Illustrated London News.*

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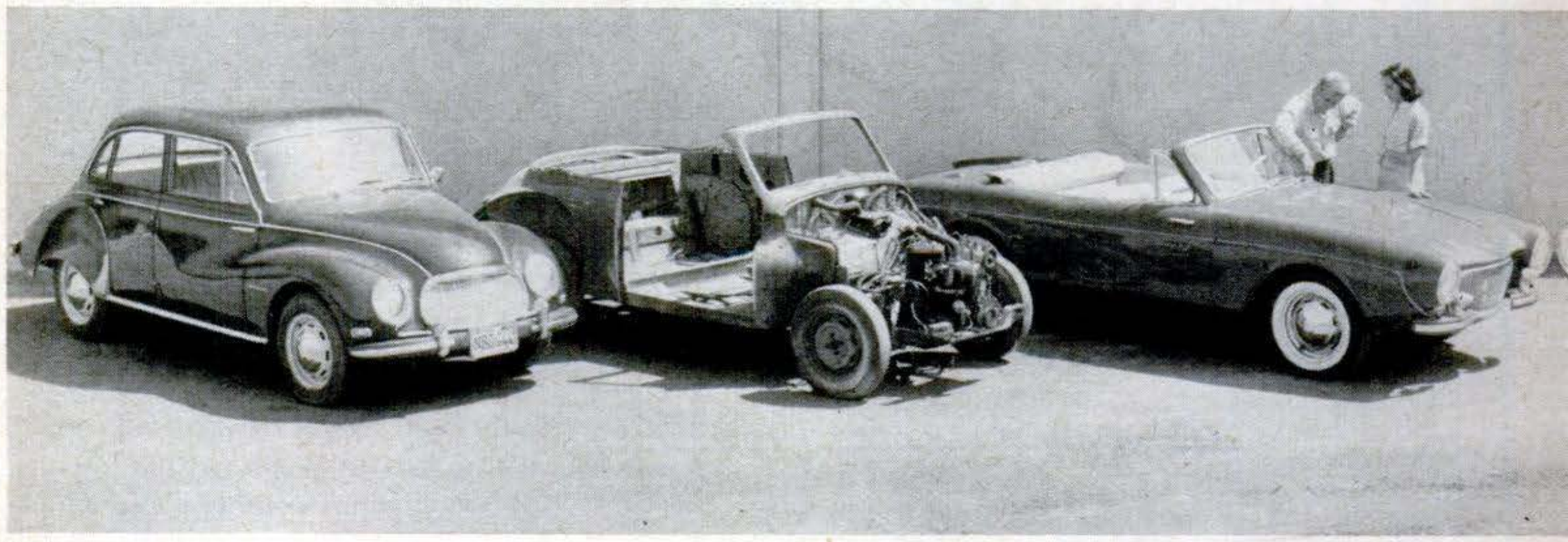
Giant toaster tests noses of supersonic missiles

THIS cone-shaped "toaster" that could handle 7,000 slices of bread a minute tests the resistance of the nose of a missile to friction heat it would encounter on re-entering the earth's atmosphere. The furnace has 1,000 quartz infrared lamps, with heat to over 1,000 degrees.

Little DKW dons flashy fiber-glass sports-car body

BELOW are three three-cylinder DKW's—at left as they come from the German factory, center with the top cut off, and at right with a new fiber-glass body. Flintridge Motors imports them for reconversion into



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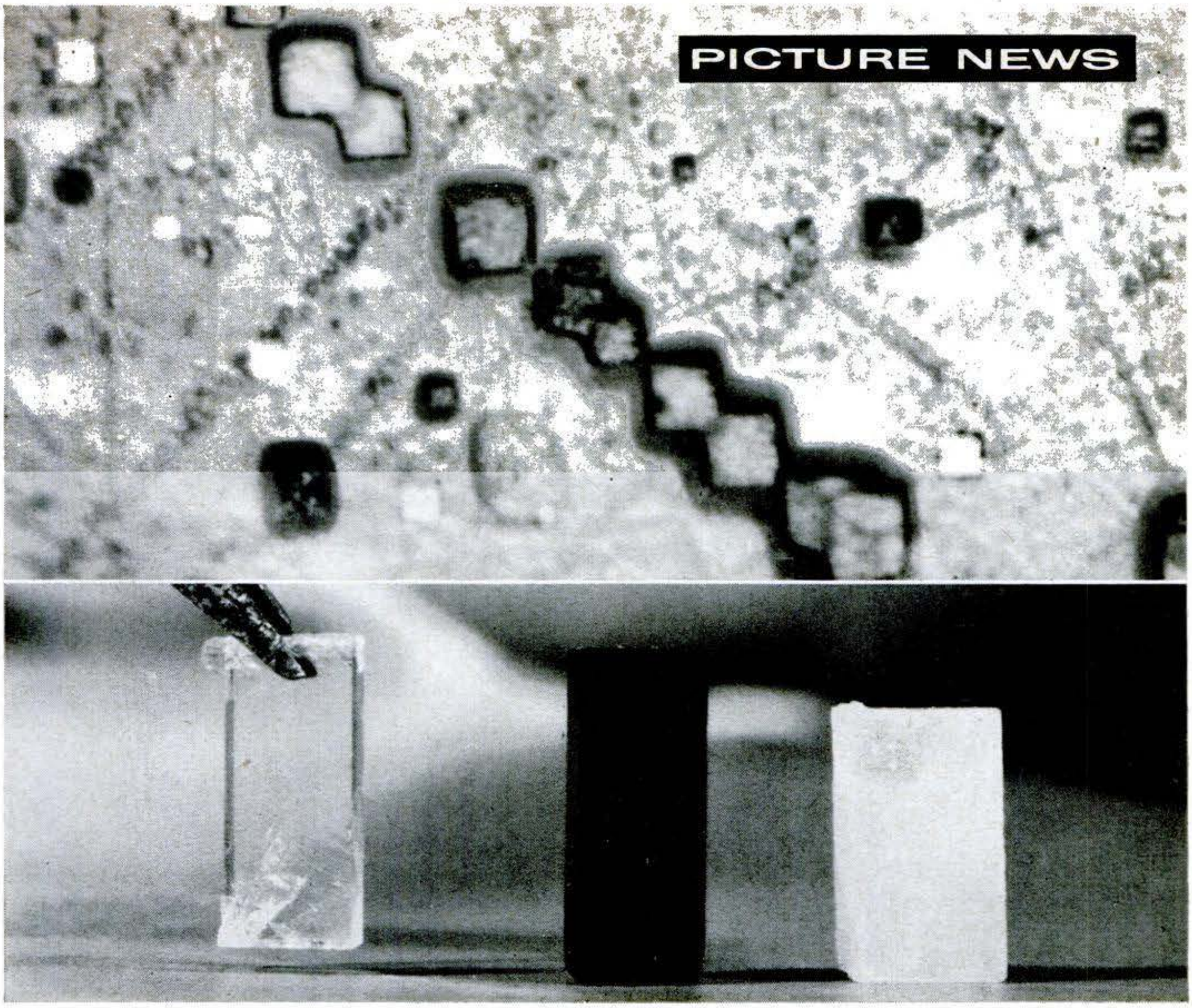
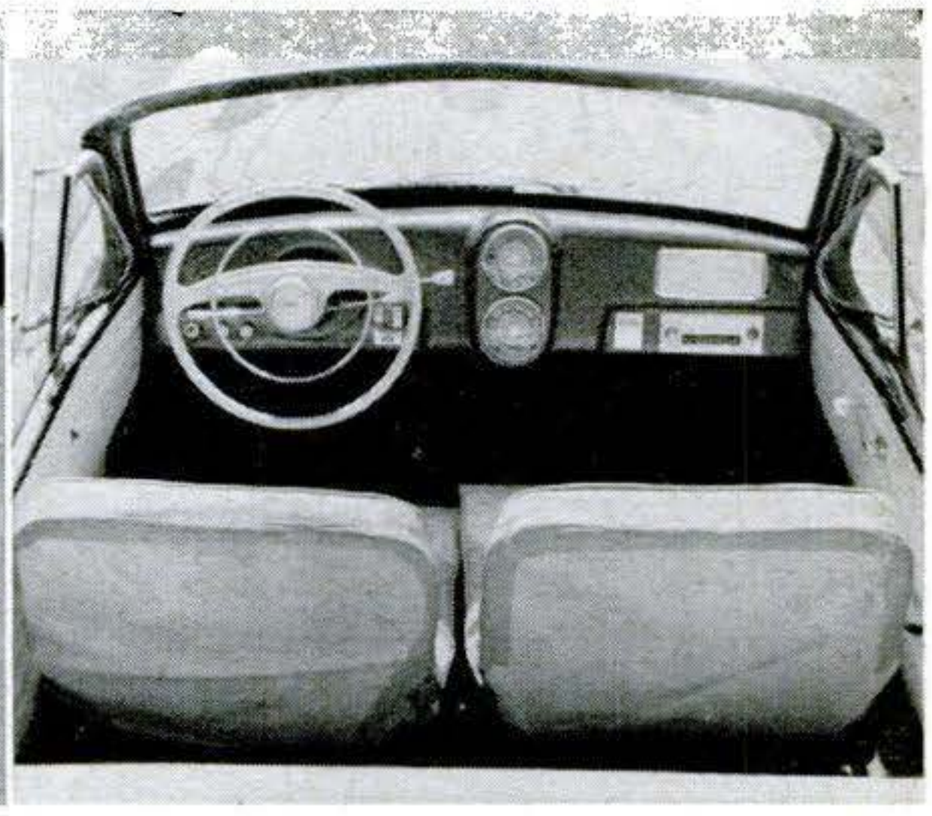


This radioactive world: Now it's square bubbles

THE first square bubbles in nature have been found by a GE scientist —in lithium fluoride crystals irradiated with neutrons in a reactor and heated to 1,112 degrees. At top, the bubbles seen through a microscope; below, the crystals untreated (left), irradiated and heated.

sports models, lengthening the lines while reducing the weight about 350 pounds. Among features are an inverted grille and a steering column (extreme right) out of a dash shifted six inches back. F.O.B. Los Angeles it sells for $3,195, about $1,000 more than the import.



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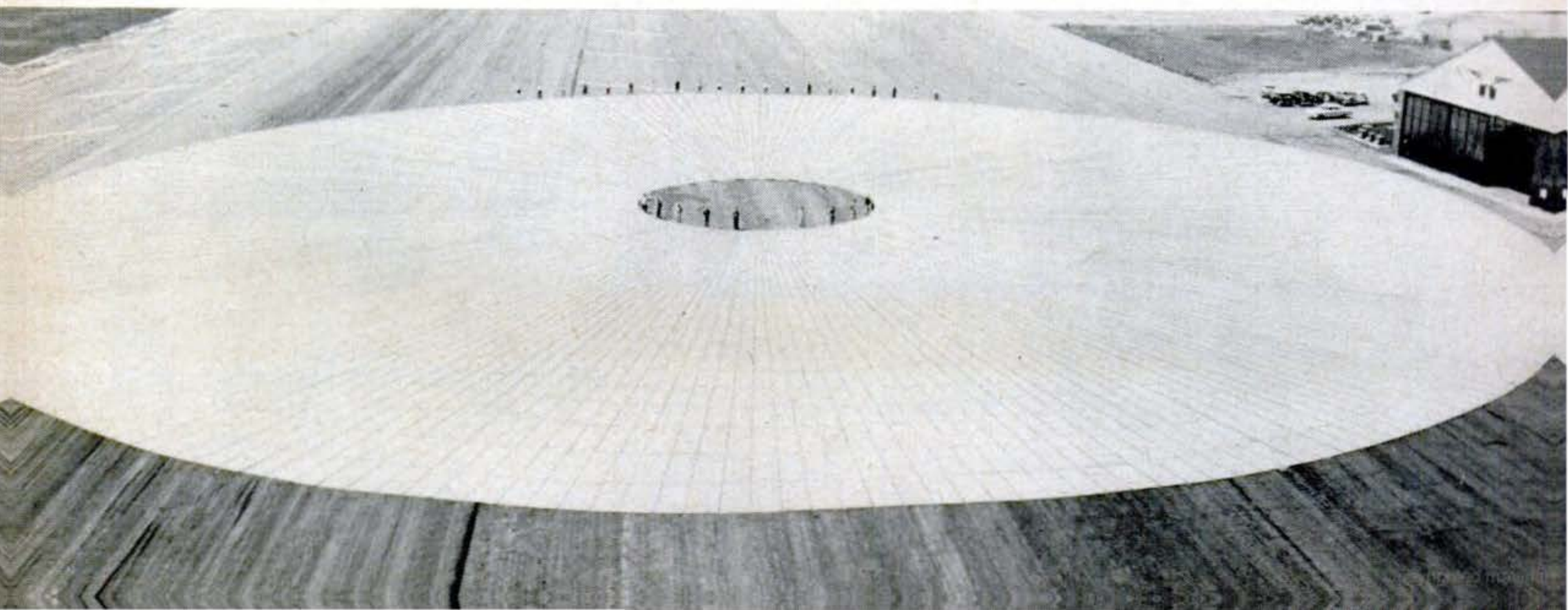
Travelers' take-apart house has parlor, bed and bath

SLEEPING quarters for four, living room, kitchen and bath are all in this 12-by-12-foot house that can be dismantled and stacked on a trailer. Its wood-and-metal frame is on adjustable poles for leveling on uneven ground or providing a carport. In Italy it sells for $1,400.

Big plastic disk to roof U.S. pavilion at Brussels fair

LAID out on the ground below are 2,100 translucent plastic panels for the roof of the U. S. building (drawing, right) at the Brussels 1958 World's Fair. Flown to Belgium from the Kalwall Corp. plant at Man-



Liquid mercury, frozen solid, drives nails into wood

AT THE University of Chicago's new low-temperature laboratory, the scientist above uses a hammer made by solidifying mercury at 346 degrees below. The lab can produce 50 quarts of minus-423-degree liquid hydrogen an hour or eight quarts of minus-453-degree liquid helium.

chester, N. H., they will be reassembled on steel-cable spokes strung between a 66-foot-diameter open metal ring and a 380-foot concrete rim.

Staged from April to October, the fair will represent 50-odd countries and international groups and be seen by 35,000,000 visitors.

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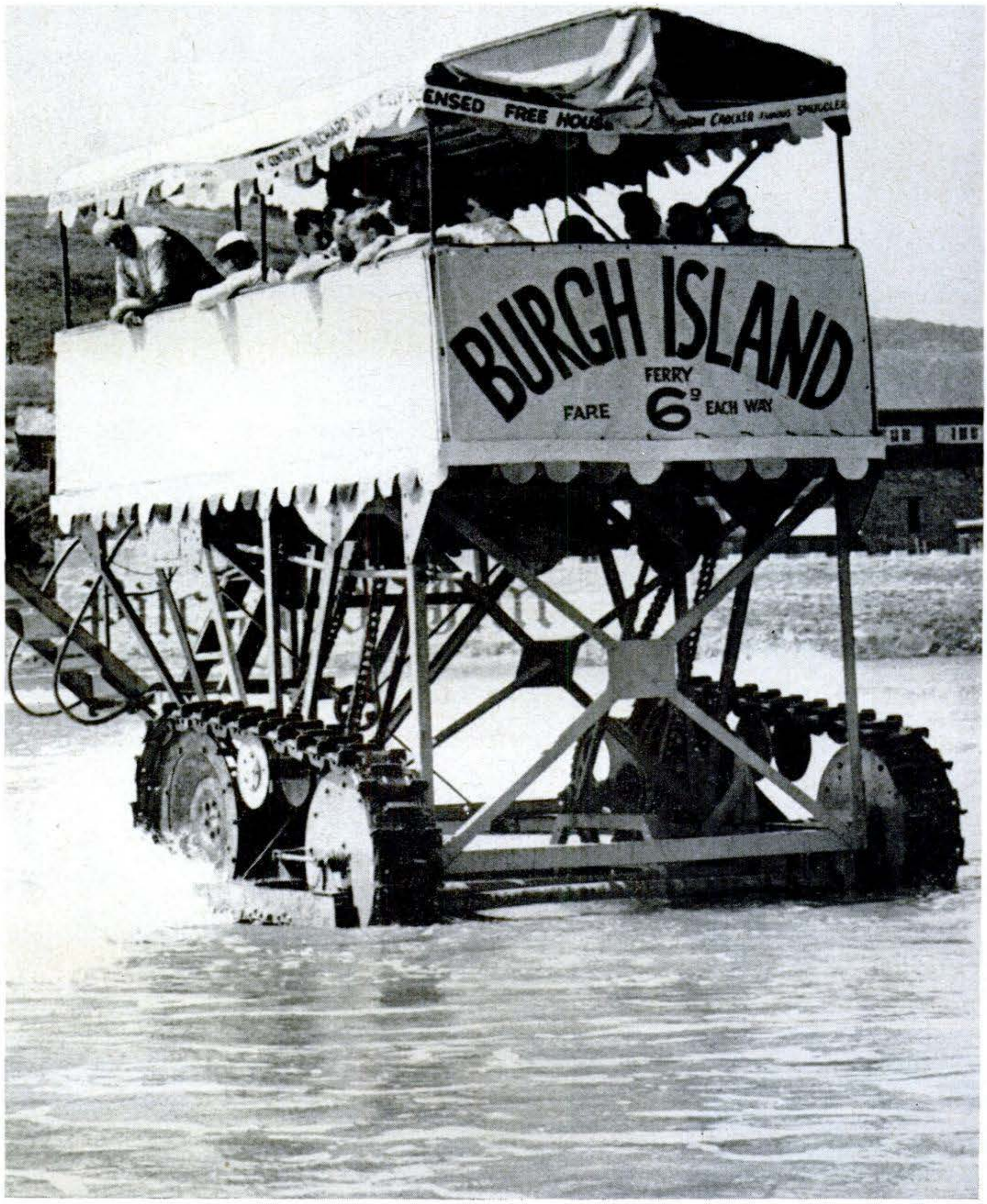

Long-legged ferryboat never gets off bottom of sea

WHEELS with tractor treads instead of a conventional boat propeller take this odd-looking vehicle from a resort on the British Devonshire coast to a nearby island. An engine on the passenger deck drives two sets of tractor wheels through a system of chains and gears.

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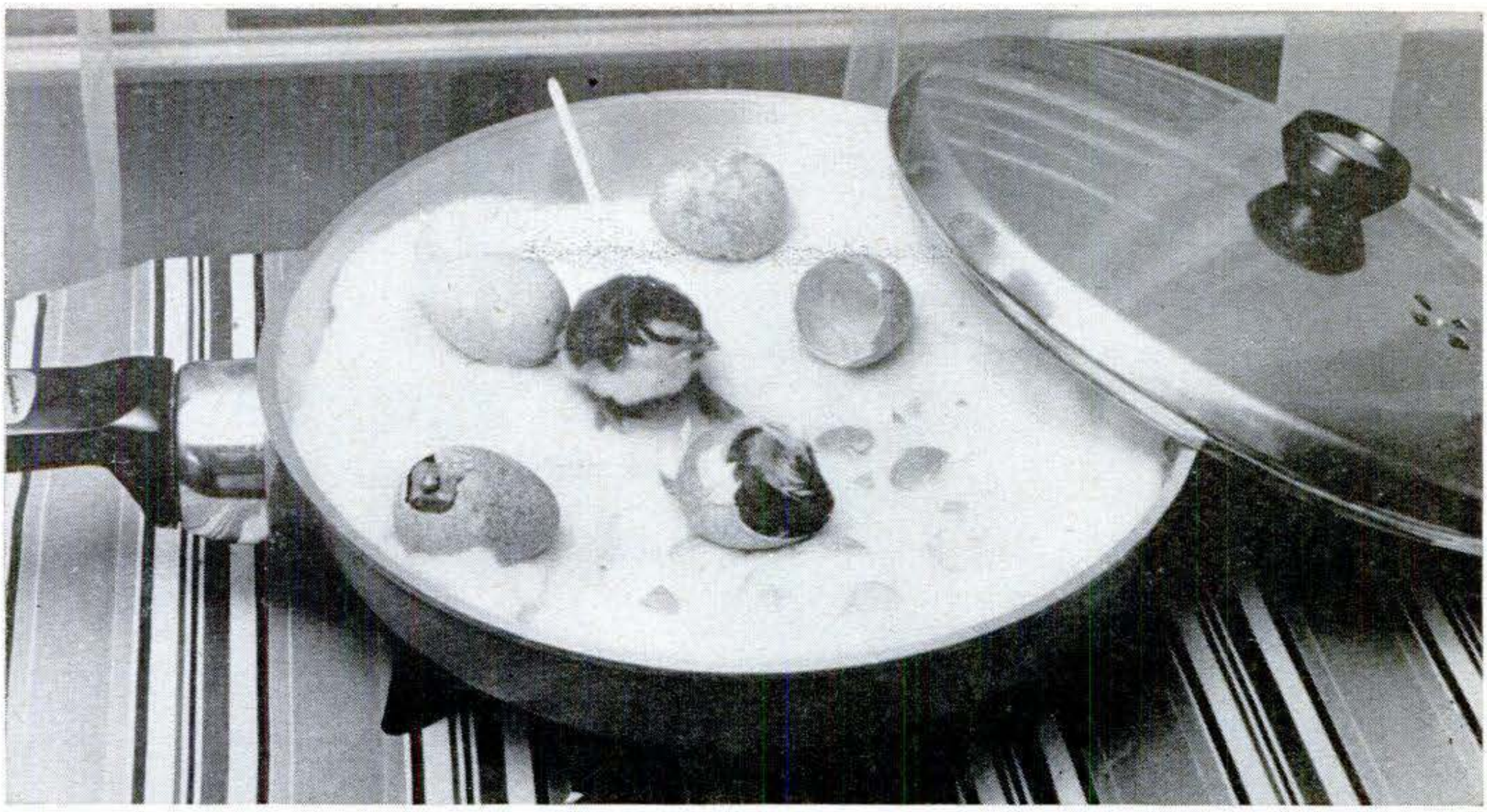
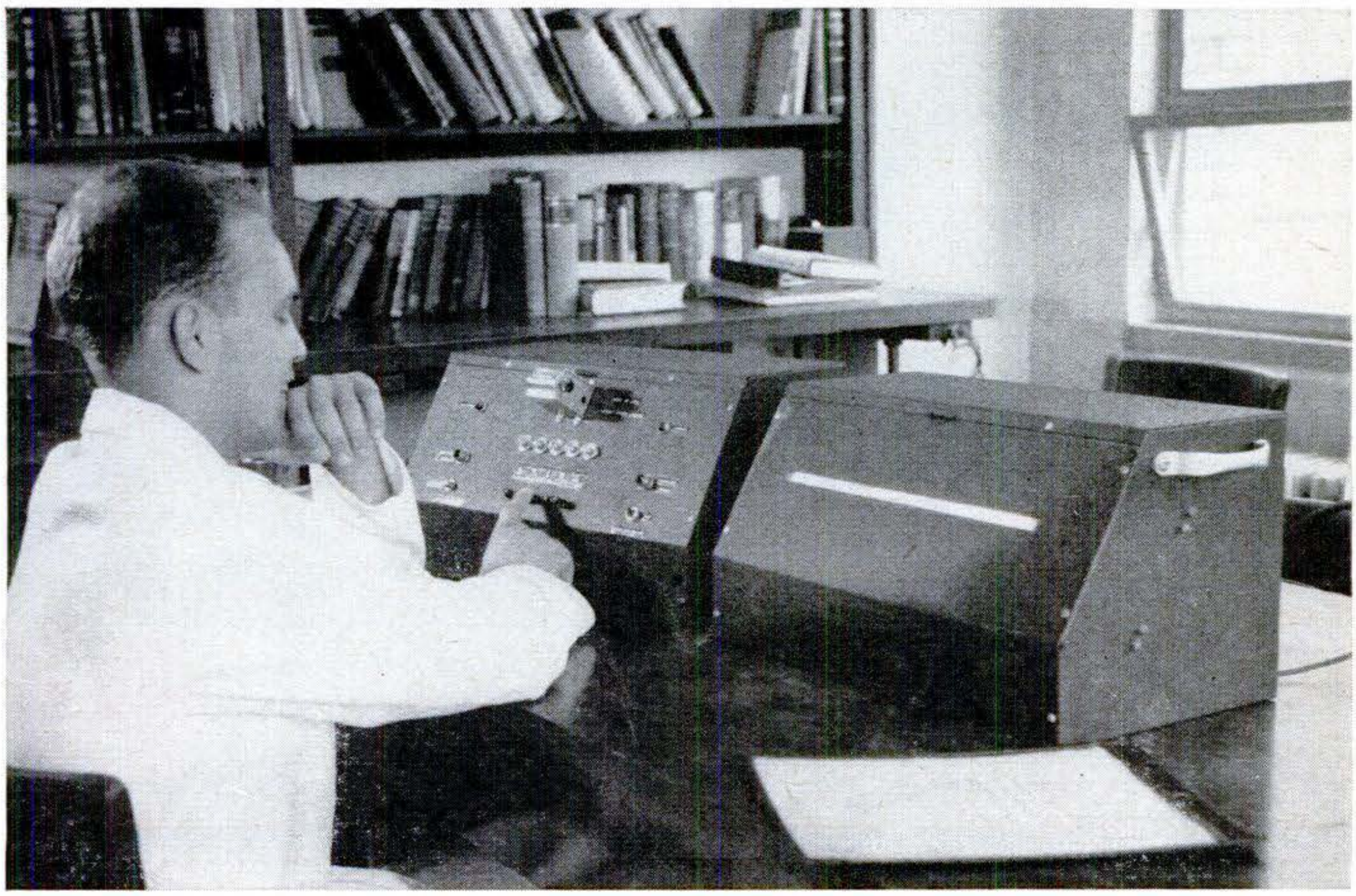


Eggs fried or hatched—electric skillet can do both

INGENUITY and an automatic electric frying pan hatched these chicks. Padded with fiber-glass to prevent hot spots, the skillet maintained a temperature of 96 to 101 degrees for four weeks of incubation. An employee at GE's Evendale plant in Cincinnati pulled the trick.

Machine tests knowledge of students boning for exam

So FUTURE doctors at Hahnemann Medical College, Philadelphia, could evaluate their study, Dr. John C. Scott and N. B. Burke built this computer. It has 50 questions and a choice of answers on a drum, records as right or wrong the button pushed, and totals the score.



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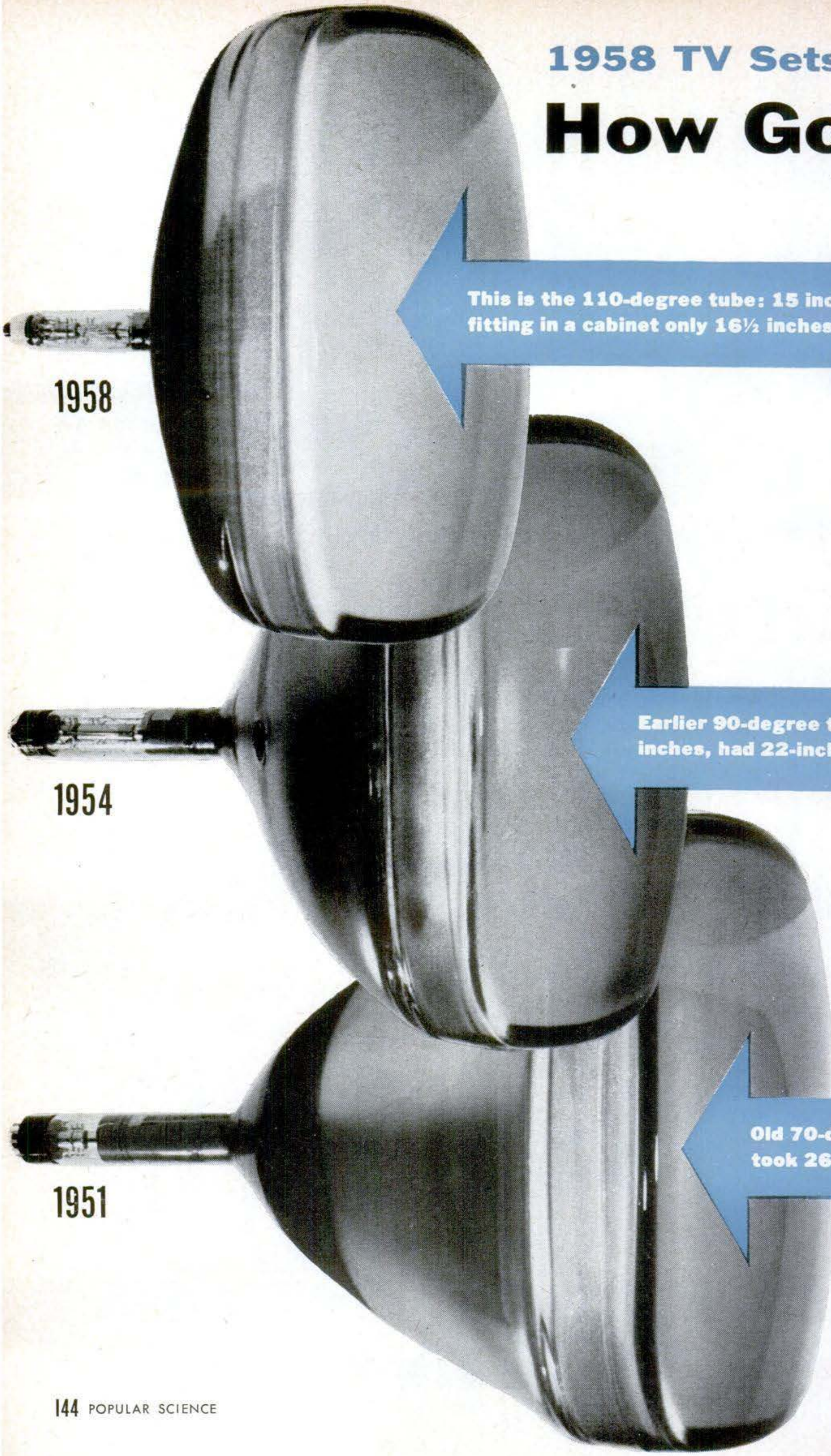
1958 TV Sets:

How Good



This is the 110-degree tube: 15 inches overall, fitting in a cabinet only 16½ inches deep

Earlier 90-degree tube was 20 inches, had 22-inch cabinet

Old 70-degree tube took 26-inch box

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Are the New Short Picture Tubes?

This year's redesigned tubes are the start toward a new kind of TV—sharper pictures, screens on the wall, real portables

By Martin Mann and Hubert Luckett

TV SETS this year look different. They're skinny. Many of the standard 21-inch receivers are only 16 inches deep—you can put a table model atop an ordinary chest of drawers and it won't hang over the edge. The 14-inch portables really look portable.

Behind the svelte look is the first major change in years: radically redesigned picture tubes. The skinniest sets use squat 110-degree-deflection tubes, the others have almost-as-short 90-degree tubes. And one tube promises a more detailed image.

That's only the beginning. Other developments now in the works:

- Still more compact picture tubes.
- Flat screens that will hang on a wall.
- Big, *big* pictures to convert your living room into a home theater.
- Transistorized TV sets operating on batteries—real portables.

How good are this year's sets? You're going to hear a lot about the 110-degree picture tube and the slim look it makes possible. The change was admittedly dictated by the cabinet stylists. The engineers claim only equal performance from a more compact package. Did they get it? Here's what's involved.

There are two ways to shorten picture tubes, short of inventing a new kind.

1. You can shorten the neck of the tube by redesigning the gun, the metal electrodes that spray out an electron beam to trace the picture. A new gun saved length on the 90-degree tube, and one was used in the 110-degree tube, too.

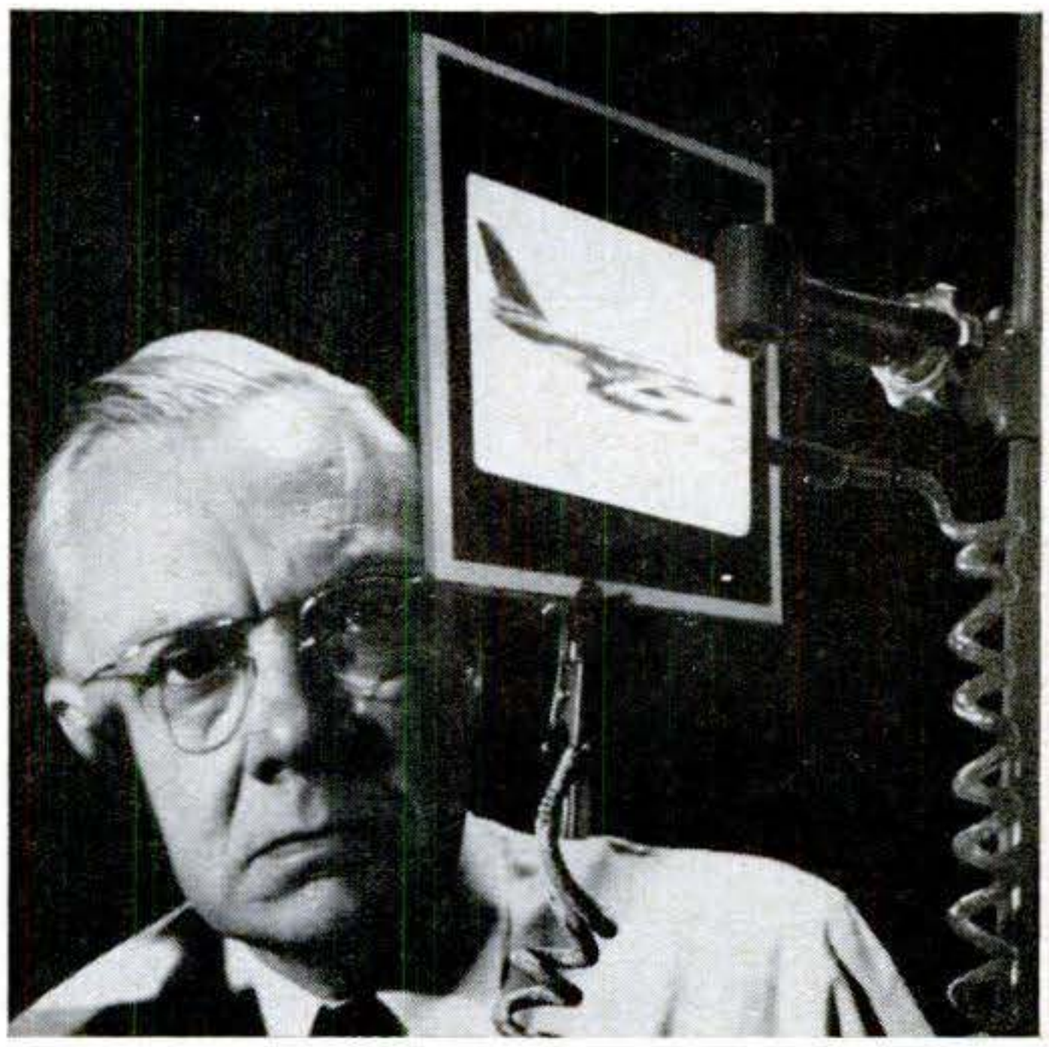
2. You can also move the gun closer to the screen. This means that the electron beam has to swivel through a wider angle to reach the picture edges. In the shortest of the new tubes, this deflection angle is 110 degrees. (Deflection angles have steadily widened since TV started—52 degrees, 70, 90 and now 110.)

Redesigning the gun doesn't entail major compromises with performance. But you pay for increased deflection angle:

- Overall sharpness of the picture is involved, and
- Heavier demands are made on certain circuits in the set.

Simple geometry raises the sharpness question. The electron beam has to travel much farther to reach the corners of the picture than it does to reach the center. The corners get blurred and distorted. This is a problem with all tubes, but it gets worse as the deflection angle widens.

One fix is to curve the screen more sharply, and this has been done on some



FLAT PICTURE PANEL FOR TV—no vacuum, no electron beam—is being developed from display devices for radar and computer use. Experimental model above is Sylvania's "Sylvatron."

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How to tell a good TV set

THE big change in TV this year is in the picture tubes. Circuits are little different. The chart at right gives manufacturers' specifications on portables and 21-inch table models. It is arranged by chassis, since the same chassis may be used in many models. Here's what to check:

Picture tubes. Deflection angles and ion traps are what designers argued about this year, as explained in the accompanying article. There is also considerable variation in the high voltage, which affects the brightness of the picture—the higher the voltage the better.

Sharpness. The circuits in the intermediate-frequency (IF) and video amplifiers are the principal limitation on picture quality. The more stages and tuned circuits there are, the better. The bandwidth that the IF can handle matters, too; in top-grade receivers it is close to the theoretical maximum, 4.0 mc.

Sensitivity. A new type of tuner—the part that gets the TV signal from the air—appears this year. It is the tetrode, a more sensitive version of the pentode, comparable to the neutrode introduced last year. Still more sensitive is the cascode. All sets have some kind of automatic gain control (AGC) to adjust amplification to the strength of the signal. AGC circuits vary widely, ranging from very simple derived types to complex keyed controls.

Filters. The more filters, and the more kinds of filters, the less your picture is likely to be messed up by signals from police, ham or aircraft radios.

Power supply. The transformerless type is cheaper, but has two minor disadvantages: (1) if one tube blows, all go dark; (2) the chassis may be electrically charged, introducing some shock hazard.

Tube functions. This tells you the number of tube jobs performed inside the set; the more the better.

MANUFACTURER	CHASSIS	SCREEN SIZE	APPROX. PRICE
ADMIRAL	16H1	14" port.	$140
	16F1	17" port.	$170
	16G1	21"	$180
	17G1	21"	$320
ANDREA	VP21	21"	$240
	VQ21	21"	$330
DUMONT	RA-392	14" port.	$159
	RA-402	21"	n.a.
	RA-400	21"	$269
EMERSON	1254	14" port.	$128
	1264	17" port.	$168
	1284	21" port.	$198
	1400	21"	$208
GENERAL ELECTRIC	Q2	14" port.	n.a.
	M3	17" port.	n.a.
	U2	21"	n.a.
HOFFMAN	327	14" port.	$170
	332/333	21"	$190
	422	21"	$370
HOTPOINT	Q2	14" port.	$140
	M3	17" & 21" port.	$170
	U2	21"	n.a.
MAGNAVOX	24 series	21"	$200
	25 series	21"	$250
MONTGOMERY WARD	4031	17" port.	$140
	5041	21"	$190
	5044	21"	$280
MOTOROLA	14P10	14" port.	$150
	17P1	17" port.	$190
	21T39	21"	$200
	21K72	21"	$230
OLYMPIC	14TT92	14" port.	$150
	17TU93	17" port.	$170
	TA100	21"	$200
	TD102	21"	$250
PACKARD-BELL	V8-2	17" port.	$170
	88S3	21"	$220
	98D3	21"	$290
PHILCO	8H25	17" port.	n.a.
	8L41	21"	n.a.
	8L71	21"	n.a.
RCA	111C	14" port.	$150
	109C	17" port.	$190
	113A	21"	$200
	116A	21"	$220
SEARS, ROEBUCK	8102	17" port.	$143
	7146	21"	$115
SETCHELL-CARLSON	P-63	17" port.	$179
	58	21"	$299
SYLVANIA	537-3	17" port.	$180
	540-3	21"	$200
	540-1	21"	$230
TRAV-LER	1722	17" port.	$140
	721-MT-600	21"	$170
WESTINGHOUSE	V-2311-45	14" port.	$130
	V-2373-1	17" port.	$170
	V-2371-24	21"	$200
	V-2372-27	21"	$240
ZENITH	15A25	14" port.	$140
	15Z30	17" port.	$160
	17A20	21"	$190
	19A20	21"	$240

Specifications apply to cheapest model using chassis indicated.
n.a. Information not available.
a Either ion-trap or non-ion-trap tubes may be used.
b Either neutrode or tetrode tuners may be used.

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CABINET SIZE (ht. x w. x d.)	WEIGHT (lb.)	DEFLECTION ANGLE	HIGH VOLTAGE (volts)	ION TRAP	NUMBER I.F. STAGES	I.F. BAND WIDTH (megacycles)	TUNED CIRCUITS IN I.F.	NUMBER VIDEO AMP. STAGES	TUNER	AUTOMATIC GAIN CONTROL	INTERFERENCE FILTERS	TRANSFORMER POWER SUPPLY	NUMBER OF TUBES FUNCTIONS
12" x 15" x 13"	30	110°	13,500	no	3	3.75	8	1	cascode	keyed	I.F. trap	no	18
14" x 16" x 15"	37	110°	15,500	no	3	3.75	8	1	cascode	keyed	I.F. trap	no	18
19" x 24" x 15"	60	110°	18,500	no	3	3.75	8	1	cascode	keyed	I.F. trap	no	18
38" x 29" x 17"	115	110°	18,500	no	3	3.75	8	1	cascode	keyed	I.F. trap	yes	18
20" x 23" x 19"	79	90°	14,500	yes	3	3.25	6	1	cascode	keyed	high-pass	yes	22
37" x 24" x 19"	98	90°	18,000	yes	3	3.25	6	1	neutrode	keyed	high-pass I.F. trap	yes	26
13" x 14" x 16"	30	90°	14,000	yes	3	3.00	10	1	cascode	derived	high-pass	no	19
19" x 23" x 17"	n.a.	110°	15,000	no	3	3.00	10	1	cascode	derived	high-pass	yes	20
34" x 26" x 18"	n.a.	90°	16,000	no	3	3.25	10	1	cascode	derived	high-pass	yes	23
11" x 14" x 15"	24	90°	12,000	yes	2	2.90	4	1	pentode	derived	I.F. trap	no	18
13" x 16" x 17"	32	90°	12,000	yes	2	2.90	4	1	pentode	derived	I.F. trap	no	18
18" x 23" x 14"	n.a.	110°	15,500	no	2	2.90	4	1	pentode	derived	I.F. trap	no	18
18" x 23" x 17"	n.a.	90°	16,500	no	3	3.60	5	1	neutrode	derived	2 I.F. traps	yes	21
12" x 14" x 14"	24	110°	11,000	yes	2	2.90	3	1	tetrode	derived	none	no	17
14" x 16" x 15"	30	110°	13,600	yes	3	3.25	4	1	tetrode	derived	none	no	17
19" x 27" x 15"	n.a.	110°	16,500	yes	3	3.50	7	1	cascode	derived	none	yes	21
14" x 17" x 14"	36	110°	16,000	no	2	2.10	4	1	neutrode	derived	2 I.F. traps	no	17
18" x 26" x 19"	82	90°	15,400	no	3	3.30	6	1	neutrode	derived	2 I.F. traps	yes	20
34" x 29" x 20"	115	90°	16,500	no	3	3.30	6	1	neutrode	keyed	2 I.F. traps	yes	24
12" x 14" x 14"	24	110°	11,000	a	2	2.90	3	1	tetrode	derived	none	no	17
14" x 17" x 14"	30	110°	13,600	a	3	3.25	4	1	tetrode	derived	none	no	17
19" x 27" x 15"	79	110°	16,500	a	3	3.50	7	1	cascode	derived	none	yes	21
31" x 22" x 20"	n.a.	90°	16,000	no	3	3.60	7	1	neutrode	derived	2 I.F. traps	yes	26
32" x 23" x 20"	n.a.	90°	16,000	no	3	3.60	7	1	cascode	keyed	4 I.F. traps	yes	29
14" x 16" x 17"	34	90°	14,000	yes	3	3.40	8	2	neutrode	derived	FM trap I.F. trap	no	17
34" x 26" x 17"	78	90°	16,000	no	2	3.00	6	1	neutrode	derived		no	16
36" x 26" x 17"	92	110°	16,000	no	3	3.40	9	1	neutrode	keyed		no	20
13" x 14" x 14"	27	90°	13,000	no	3	3.50	7	1	cascode	keyed	high-pass FM trap	no	17
14" x 17" x 15"	38	110°	15,000	no	3	3.50	7	1	cascode	keyed		no	18
19" x 25" x 17"	74	90°	18,500	no	3	3.50	8	1	cascode	keyed		no	18
35" x 25" x 16"	90	90°	18,500	no	3	3.50	8	1	cascode	keyed		yes	18
12" x 14" x 12"	29	90°	15,000	no	2	2.85	4	1	tetrode	derived	FM trap	no	19
13" x 16" x 14"	38	90°	15,000	no	2	2.85	4	1	tetrode	derived	FM trap	no	19
18" x 26" x 18"	82	90°	17,000	no	2	2.85	5	1	tetrode	derived	FM trap	yes	19
18" x 26" x 18"	85	90°	19,000	no	3	n.a.	8	1	cascode	derived	FM trap	yes	22
15" x 18" x 13"	45	110°	14,000	no	3	3.25	4	1	cascode	derived	none	yes	19
19" x 27" x 20"	100	90°	18,000	yes	3	3.25	4	1	neutrode	derived	none	yes	20
19" x 30" x 16"	110	110°	18,000	no	4	3.75	5	2	neutrode	keyed	n.a.	yes	26
15" x 17" x 15"	33	110°	15,500	no	3	3.25	7	1	tetrode	derived	n.a.	no	18
19" x 25" x 18"	75	90°	17,500	yes	3	3.25	7	1	cascode	derived	n.a.	yes	21
19" x 27" x 19"	71	90°	20,000	yes	3	3.25	7	2	cascode	derived	n.a.	yes	24
14" x 14" x 15"	26	90°	13,000	no	3	3.25	6	1	cascode	derived	high-pass 2 I.F. traps FM trap	no	28
16" x 17" x 16"	34	110°	15,000	no	3	3.25	6	1	cascode	derived		no	28
19" x 24" x 16"	79	110°	15,000	no	3	3.25	7	1	cascode	derived		yes	27
19" x 22" x 17"	70	110°	17,000	no	3	3.25	7	2	cascode	keyed		yes	29
15" x 18" x 17"	31	90°	13,000	no	2	3.00	5	1	tetrode	derived	none	no	n.a.
22" x 23" x 22"	65	90°	13,000	no	2	3.00	5	1	pentode	derived	none	no	n.a.
13" x 17" x 11"	37	90°	13,000	no	3	4.00	9	1	cascode	keyed	high-pass	yes	23
23" x 23" x 17"	78	90°	16,000	no	3	4.00	10	1	cascode	keyed	high-pass	yes	24
13" x 16" x 14"	34	110°	16,500	yes	3	3.30	7	1	cascode	keyed	n.a.	no	21
17" x 21" x 14"	49	110°	16,500	no	3	3.30	7	1	tetrode	keyed	n.a.	no	20
20" x 24" x 17"	68	110°	16,500	no	3	3.30	7	1	cascode	keyed	n.a.	no	21
13" x 16" x 16"	40	90°	13,500	yes	2	3.50	5	1	b	derived	FM trap	no	18
18" x 22" x 20"	75	90°	13,500	no	2	3.50	5	1	b	derived	FM trap	no	18
12" x 14" x 16"	27	90°	11,000	yes	3	3.35	8	2	pentode	derived	2 I.F. traps	no	17
14" x 16" x 13"	29	110°	14,500	no	3	3.35	8	1	neutrode	derived	2 I.F. traps	no	17
21" x 24" x 19"	75	90°	14,300	yes	3	3.35	8	2	tetrode	derived	none	no	18
21" x 24" x 16"	72	110°	15,500	no	3	3.35	9	1	neutrode	keyed	2 I.F. traps	no	19
14" x 17" x 14"	32	90°	14,000	yes	3	3.50	8	1	cascode	derived	I.F. trap	no	19
14" x 20" x 17"	48	90°	14,500	yes	3	3.50	8	1	cascode	derived	I.F. trap	no	19
20" x 23" x 17"	n.a.	90°	18,000	no	3	3.75	10	1	neutrode	keyed	I.F. trap	yes	19
20" x 23" x 17"	n.a.	90°	20,000	no	3	3.75	10	1	cascode	keyed	I.F. trap	yes	22

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110-degree tubes. But sharper curvature introduces its own distortions—you expect to look at a flat image, not one shaped like part of a big ball.

Backers of the 110-degree tube say that any falling off of the picture in the corners is so slight as to be unnoticeable. The quibblers say that the picture degradation may be slight, but it's there.

The other penalty for wide deflection involves the yoke—an electromagnet—which has to work harder to swing the electron beam back and forth through the wider angle. To some extent, the engineers got around this by designing a more efficient yoke, and by slimming the picture-tube neck (another production headache), which puts the yoke closer to the electron beam. Even so, the 110-degree tube calls for 30 percent more power from the set's horizontal-deflection circuit than the 90-degree tube does. And this circuit has been beefed up. (It has always been one of the hardest worked parts of a television receiver; its horizontal-output tube is more likely to die on you than any other tube in the set.)

Catch those ions. This year's reworking of picture tubes reopened an argument of some standing among tube designers: Do you *need* an ion trap?

The ions they worry about are electrified molecules of air inside the tube (the vacuum can't be perfect, after all). What happens is that the powerful electron beam smacks the air molecules, either ripping an electron loose (positive ion) or forcing an extra electron into the molecule (negative ion). The negative ions shoot along with the electron beam and hit the phosphor screen. And since the ions are about 60,000 times heavier than the electrons in the beam, they make the screen burn out faster than it otherwise might. The positive ions travel in the other direction and smash into the filament of the tube, which doesn't do that essential bit of wire any good, either.

Ion traps catch these ionized air molecules before they can cause any harm. Commonly, a magnet curves the streams of electrons and ions both. But the ions, being so much heavier, curve less sharply and are caught by an electrode outside the electrons' path. The trouble is that the ion-trap magnet often gets misadjusted and you're back where you started.

This year many big makers (notably RCA, Sylvania) have dropped the ion trap. They figure that:

- It eliminates a troublesome adjustment.
- Improved vacuum techniques leave few air molecules to form ions anyway.
- The aluminum backing on the screen (now standard in every set listed in the PS spec chart) stops the few negative ions that are created.

General Electric is a major dissenter. Its engineers claim that the ion trap does prolong tube life because:

- The vacuum can't be perfect.
- The aluminum backing helps stop negative ions but does nothing about the positive ions that go the other way to batter the filament.

So this year you can take your choice.

More detail. One of 1958's crop of new picture tubes boasts an improvement all tube engineers have been expecting. This is a refinement of the electrical lenses in the gun to give higher transconductance, which means that the tube can reproduce a full range of tones—white to black—from a weaker television signal. Such a tube requires less amplification of the signal by the video amplifier circuit. This advantage can be exploited in either of two ways:

1. The video amplifier can be simplified, saving money.
2. The video amplifier can be reworked, with no cost saving, to amplify a greater range of frequencies in the television signal and add detail to the picture.

Zenith is first to come out with a high-transconductance tube, its Sunshine Tube. It chose alternative No. 2 and increased the pass-band of the video amplifier. Trade reports say that it shows in the picture.

Look for other makers to follow suit shortly. They are likely to exploit high transconductance both ways: to cut costs on some sets, improve detail on others.

What's coming? The men who get paid for staring out the window and dreaming are thinking of flat TV tubes—a couple of inches front-to-rear. A really big one could hang on your living-room wall. A 21-inch size might fold into something like today's portable phonograph, which could be truly portable—no power cord. The dream will evolve in stages:

1. A tube with a deflection angle of

[Continued on page 250]

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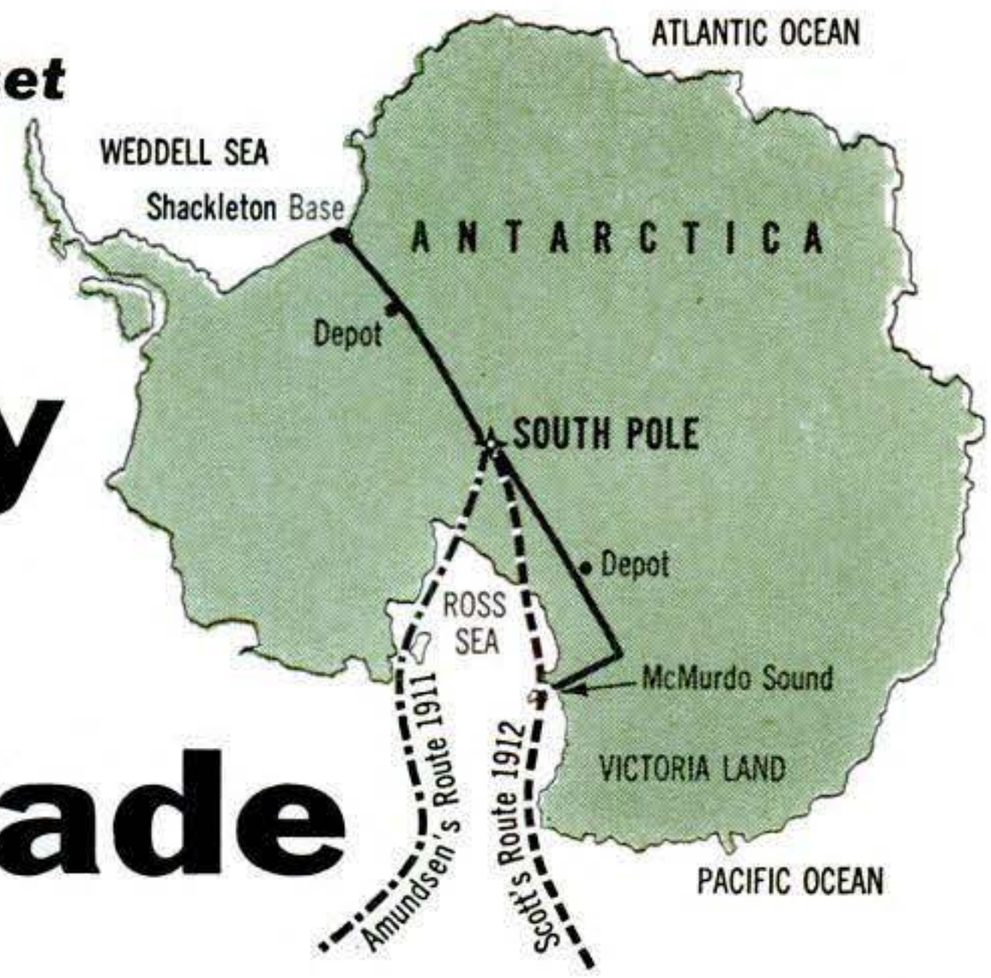
British South Pole expedition gets set to travel 2,000 miles across the bottom of the world on:



The Journey No Man Has Ever Made

By Gardner Soule

THE "long-johns-forever" boys—11 men who may not strip off their underwear till next March—are about to start off on a journey explorers have been dreaming about since the early 1900's: A 2,000-mile trek across the Antarctic, via the South Pole.

Says Sir John Hunt, leader of the British team that climbed Mount Everest: "This is the last great adventure on earth left to man."

In this International Geophysical Year, a dozen nations have established stations for scientific research in Antarctica. But these 11 men are attempting something no one has ever before achieved—a land

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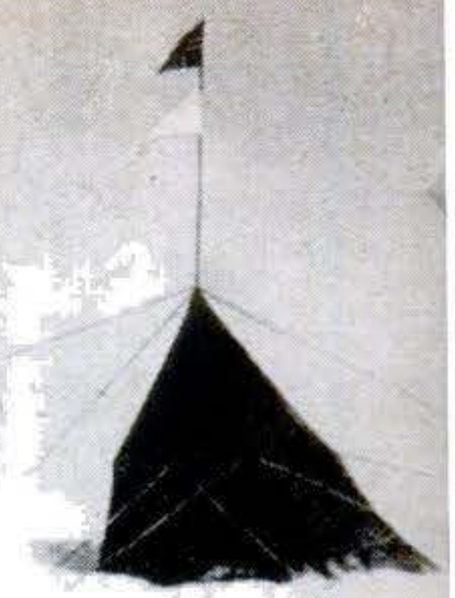
Conquerors of Antarctica hail from different nations

A Norwegian, Amundsen, got to the South Pole first, making the only overland round trip so far. Britain's Scott came in second, but perished on the way back. Operation Deep Freeze, under U. S. Navy's Dufek, has a stopping-off place at the Pole for the British team of hardy men now crossing Antarctica.



journey across this vast expanse of ice, rock and snow covering an area of some six million square miles.

Why, in this day when planes can carry you across the south polar region in a few hours, do men instead take four months to attempt what is called the worst journey in the world?

The men, members of the British Commonwealth Trans-Antarctic Expedition, are—like Hunt's Everesters—out for adventure. But they also want to know things you can only find out on the ground—or on the ice:

Is there uranium? The worst feature of the worst journey in the world—the wind—may help answer the question. The wind freezes your breath into an ice mask on your lower face. You hate the mask till you realize it keeps off the wind. The same wind keeps rock outcroppings all across the Antarctic free of snow. It even, in fact, wears down the rock. The rocks are, therefore, open for inspection—

"LET'S MEET HERE." Hillary of Mt. Everest fame (left) will help Dr. Fuchs (right) and his team across the difficult Victoria mountains as they cross the vast, gale-swept Antarctic on foot.

and uranium will be diligently sought all the way across the bottom of the globe.

Gold, silver, platinum? Any place as big as the Antarctic (the size of Europe plus Australia) must have, explorers believe, all these—plus other useful minerals. The rocks will be studied, as in the case of uranium, for evidence.

What's the terrain really like? Of the 2,000 miles the expedition will cover, 1,900 never have been trod by man. All the route will be mapped.

How much ice is there? The men will estimate it. They will fire explosive charges into the ice every 20 minutes or so, and determine its thickness by measuring the time that elapses between an explosion and its echo. This will tell whether the Antarctic is a continent, as has been thought, or something else—perhaps a series of islands covered and joined by ice. An informed guess, as of now: That it is not one continent, but is split at least in two by a cleavage along the expedition's route.

The Antarctic, continent or not, has never been crossed on its surface. Up till now, in fact, only one man—Roald Amundsen of Norway—has led an overland expedition that got to the South Pole and returned successfully. Amundsen, in December, 1911, discovered the Pole. Britain's Robert Falcon Scott, who was racing him, got to the Pole in January, 1912, but perished with four companions a few miles from help on the way out. Britain's Ernest Shackleton, still earlier, made long overland journeys, but failed to reach the Pole. A number of long sledging trips, in recent years, have not attempted the Pole at all.

For Dr. Vivian E. Fuchs, leader of the 1957-8 attempt, the worst journey in the world should be much better than it was

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SCOTT

DUFEK

for Shackleton, Amundsen and Scott. Mechanized equipment and additional support from others are the reasons why:

Fuchs and his group will set out from their base at Shackleton camp, on the Atlantic, about November 1. They will take Husky dogs, sledges, scientific equipment—and four-ton Sno-Cat tractors in whose enclosed cabs, they hope, they will ride a good part of the way. If the Sno-Cats can negotiate ice ridges, crevasses and mountainsides, they may cover as much as 40 miles a day, as against 15 (or fewer) with dogs and sleds. To help the Sno-Cats over crevasses, they are taking a sectional aluminum bridge.

In attempting to use mechanized equipment, Fuchs is, believe it or not, following both Shackleton and Scott. Shackleton, in 1908, also wanted to ride—not walk. He took along an Arrol-Johnston touring car (for use in temperatures to minus 100). Sir Raymond Priestley, who was with him, remembers that the car did cover 10 miles before its wheels bogged in the snow.

Scott, as long as 46 years ago, actually had tractor-tread vehicles, but had to abandon them at the outset of his journey to the Pole because no one then knew how to keep automotive engines operating in Antarctic cold. Fuchs and his men have devices to preheat their engines and batteries.

About Christmas or New Year's, the 1957-8 trans-Antarctic travelers expect to reach the U. S. base at the South Pole. (The Americans established this base by air—not by land. It's a part of Operation Deep Freeze, under the command of Rear Admiral George J. Dufek, USN.) Here they will obtain a welcome, warmth, companionship and a fresh supply of food. The American small town (insulated huts) at the Pole today is a far cry from what Amundsen found there: a lonesome, barren ice desert. Or what Scott, with a sinking heart, found: a flag, a tent and notes from Amundsen saying the Norwegians had got there first.

The British explorers, who will spend the nights in sleeping bags and tents on the long trek, will have—if they want to use it—a chance to take off their woollies and bathe in hot-water showers at the U. S. base. They may not, because one school thinks that you should remain acclimatized by sleeping in tents right straight through. In preparing for their junket, some members of the British party actually spent every night of an Antarctic winter in tents. They stayed bundled up to do it, and this caused Kenneth Blaiklock, a surveyor at Shackleton base, to name the expedition the "long-johns-forever" boys.

About the fourth week in January, 1958—or four weeks after leaving the American camp at the South Pole—Fuchs and his men expect to meet a party advancing toward them from the Pacific. This team will be led by Sir Edmund Hillary, one of the two men who first ascended Mount Everest (under John Hunt). The Victoria mountains, in Hillary's territory, are a big reason he got the assignment. Hillary has been down there this year, trying to find a way to lead out Fuchs and his men via the Ferrar glacier, one of the gigantic rivers of ice that are often the only passageways through the ranges. He aims to bring the party to the Pacific at Scott base, McMurdo Sound. The U. S. Navy has an air base two miles from Scott base.

Fuchs hopes his Sno-Cats will last at least till the Ferrar glacier. Like Fuchs,

[*Continued on page 254*]

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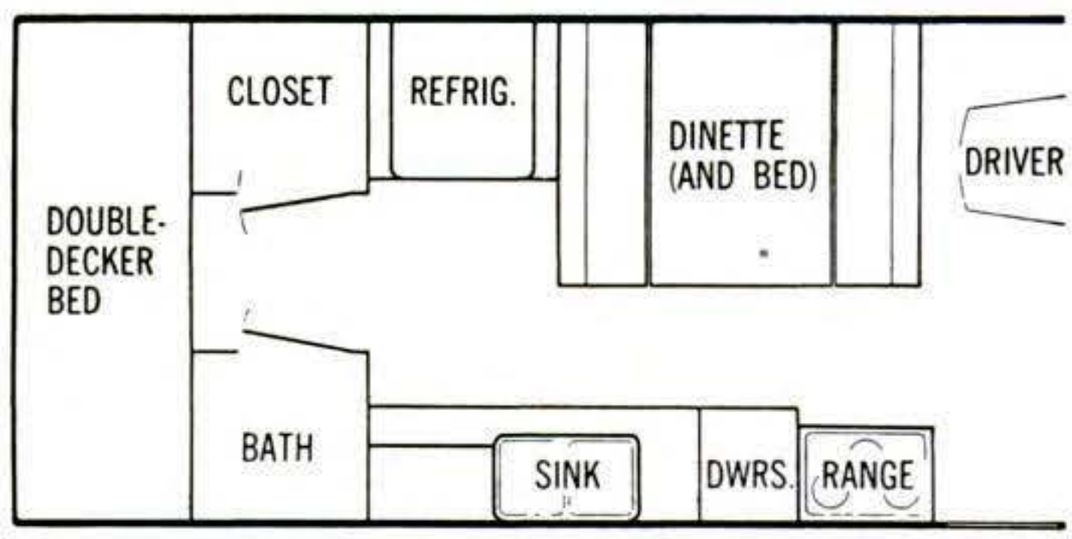
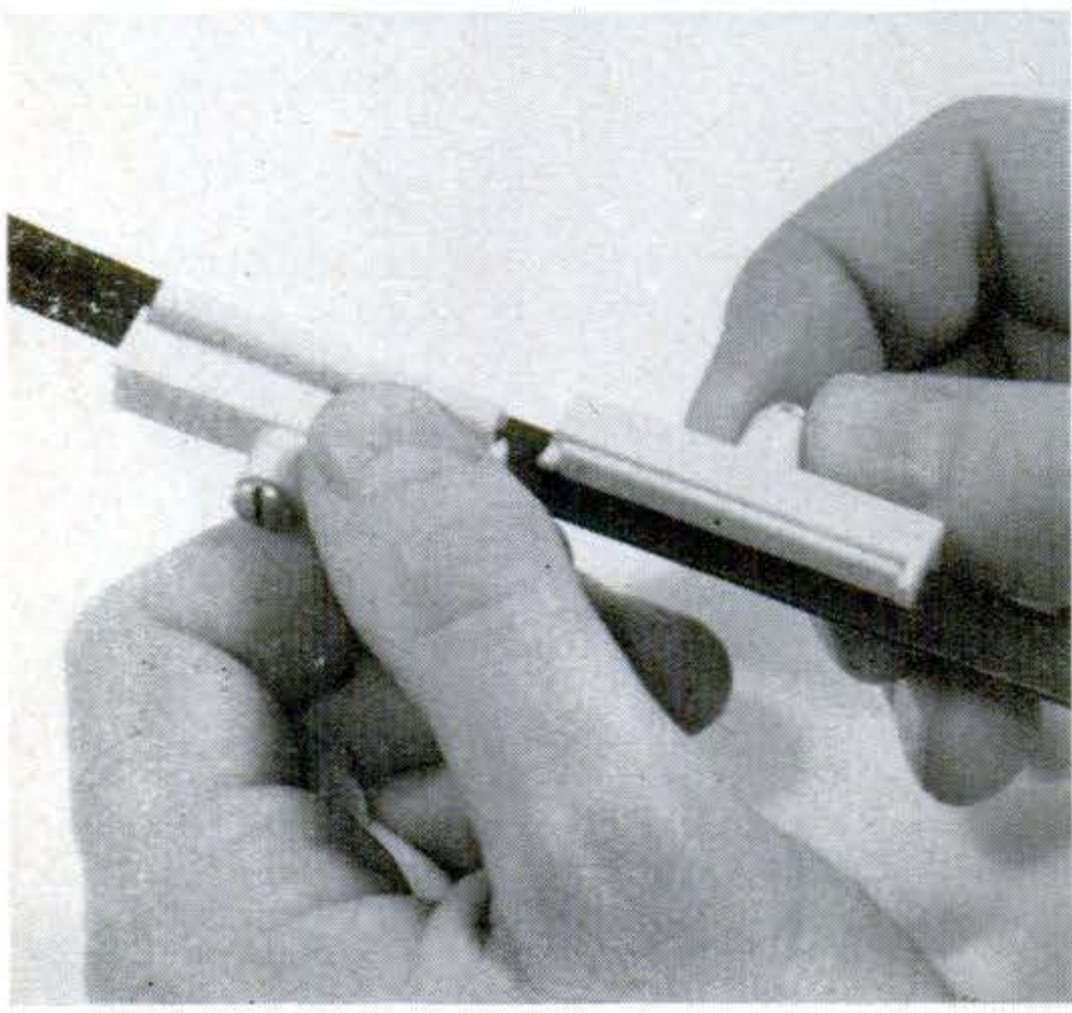
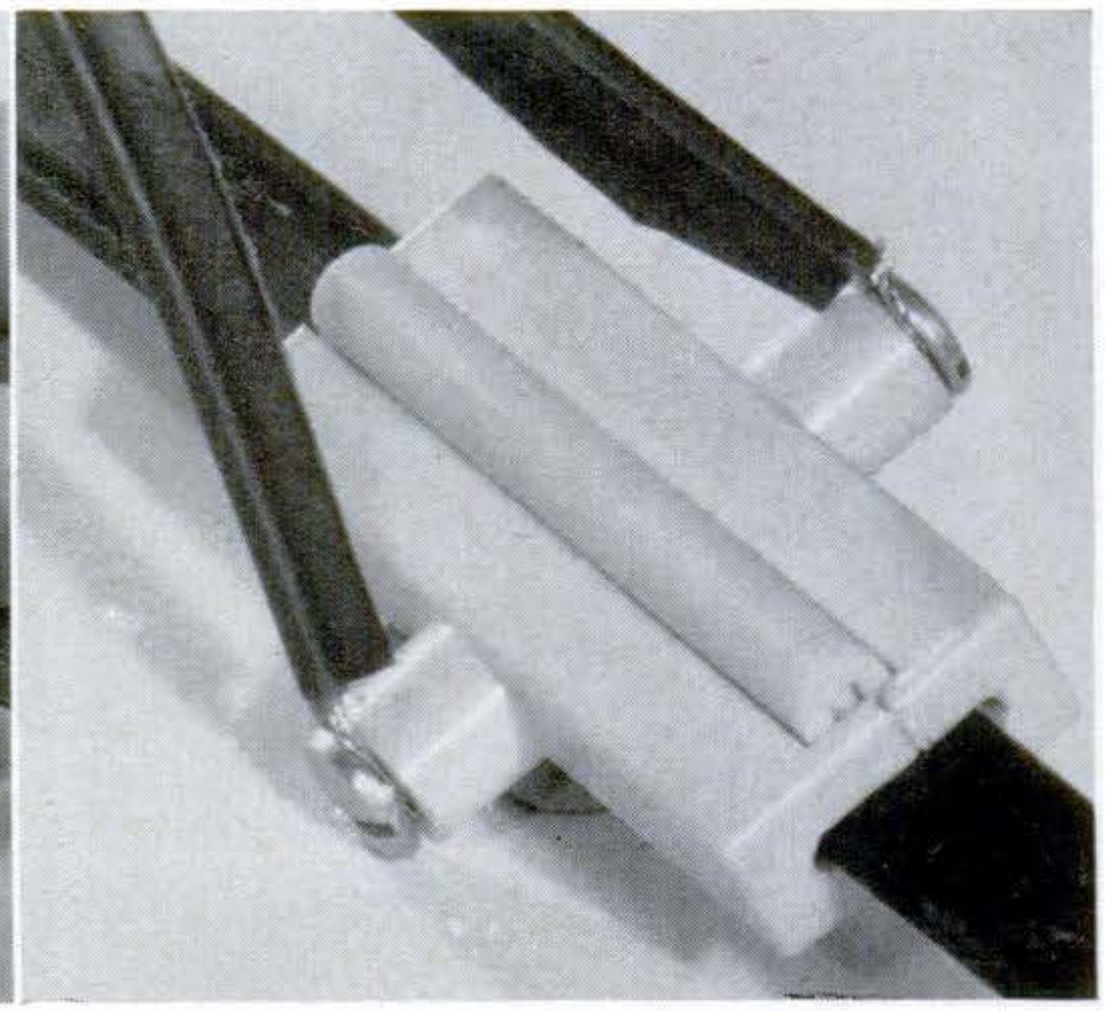
New Aids to Living

1 Living space for four is tucked into this land cruiser which you handle like a family car. Measuring 19½ feet from bumper to bumper, it has a wheelbase of 122 inches. It has a butane stove, refrigerator, water heater and lights. There is also a 115-volt electrical system for lighting if a hookup is nearby. It comes in six-cylinder and V-8 models with manual or automatic transmission.



2 TV isolator take-off permits one antenna to do double duty in a two-set home. You just slide the halves of the unit together over the twin lead running from the antenna to the first set (left) and connect the take-off to the second set with twin lead (right). For each additional TV set, another unit is added.





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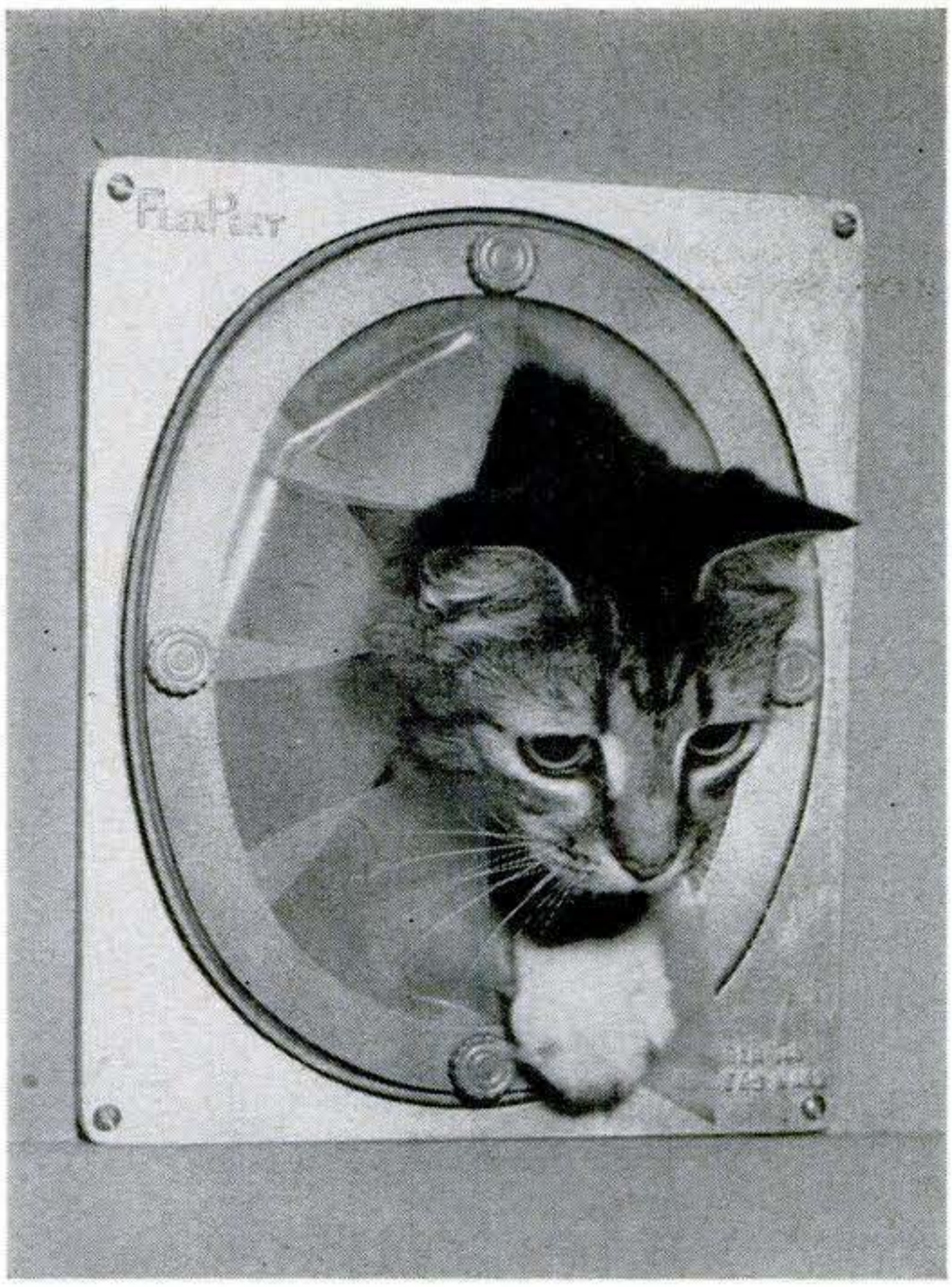
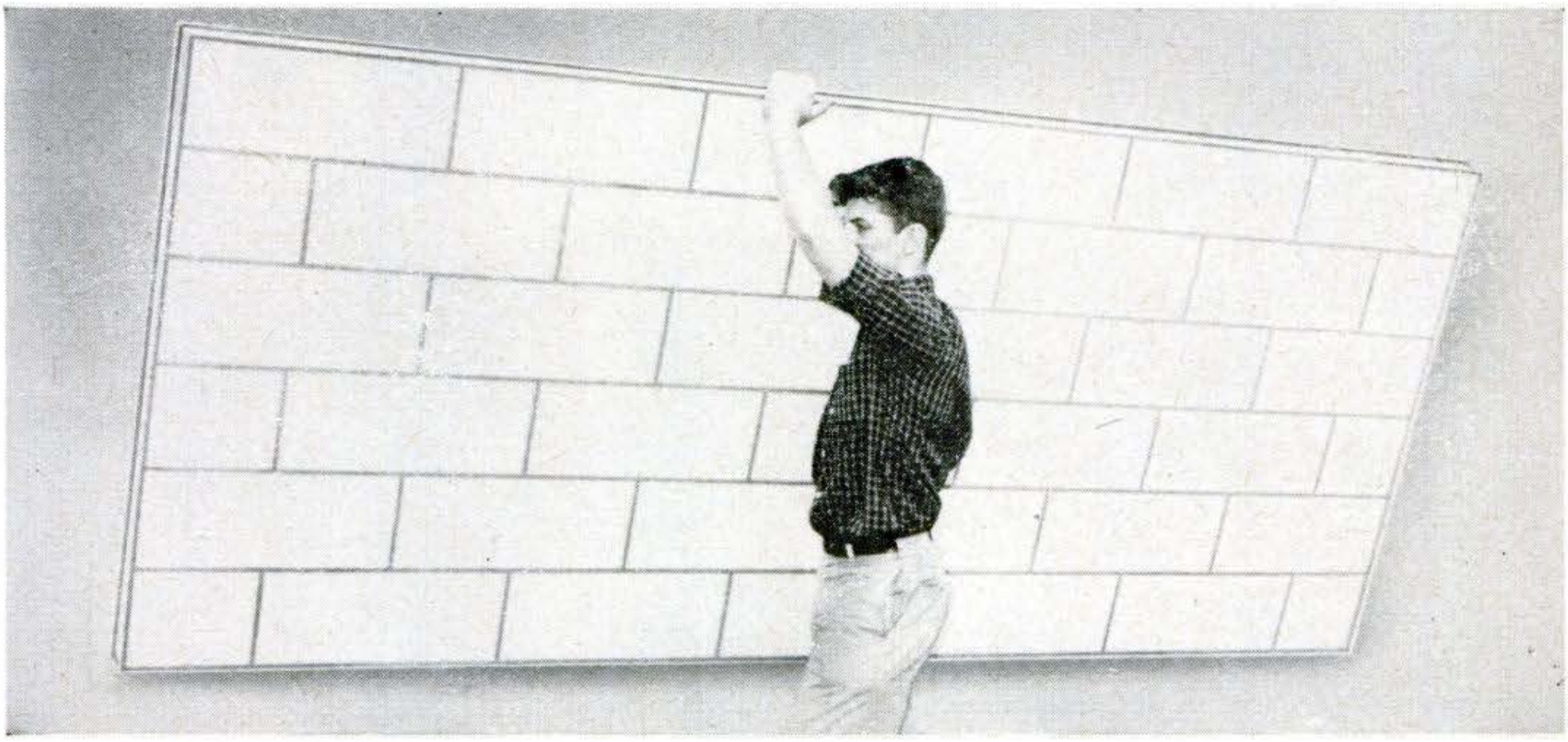


3 **Porthole for pets** spares you the nuisance of opening the door every time the family pet wants in or out. Triangular shutters of flexible plastic open as your cat or dog shoulders its way through, then close again after its passage to protect the house from drafts.

4 **Spray-on shoe polish** dries instantly and gives you a lasting shine that needs no buffing. It can be used on shoes of any color. The coating is water repellent. The maker says the no-rub polish is not a lacquer but a dressing that lets the shoe leather "breathe."

More information *about the products shown on these pages can be obtained from: 1. Case Liv-N-Roam Cruiser Division, Custom Bilt Body, Inc., Camp Rd., Hamburg, N. Y.; 2. Charles Engineering Co., Inc., 6053½ Melrose Ave., Los Angeles 38; 3. Turen, Inc., Beaver Park, Danvers, Mass.; 4. Dapper Cleaners, 329 Fourth Ave., NYC 10; 5. Kalwall Corp., Manchester, N. H.*

5 **Translucent structural panel** is rugged enough for load bearing, and light enough so that one man can handle it. The material, reinforced plastic bonded to an aluminum grid, is designed for use as interior or exterior walls, and nonglare roofs (see p. 140). Panels come in six colors and several sizes.



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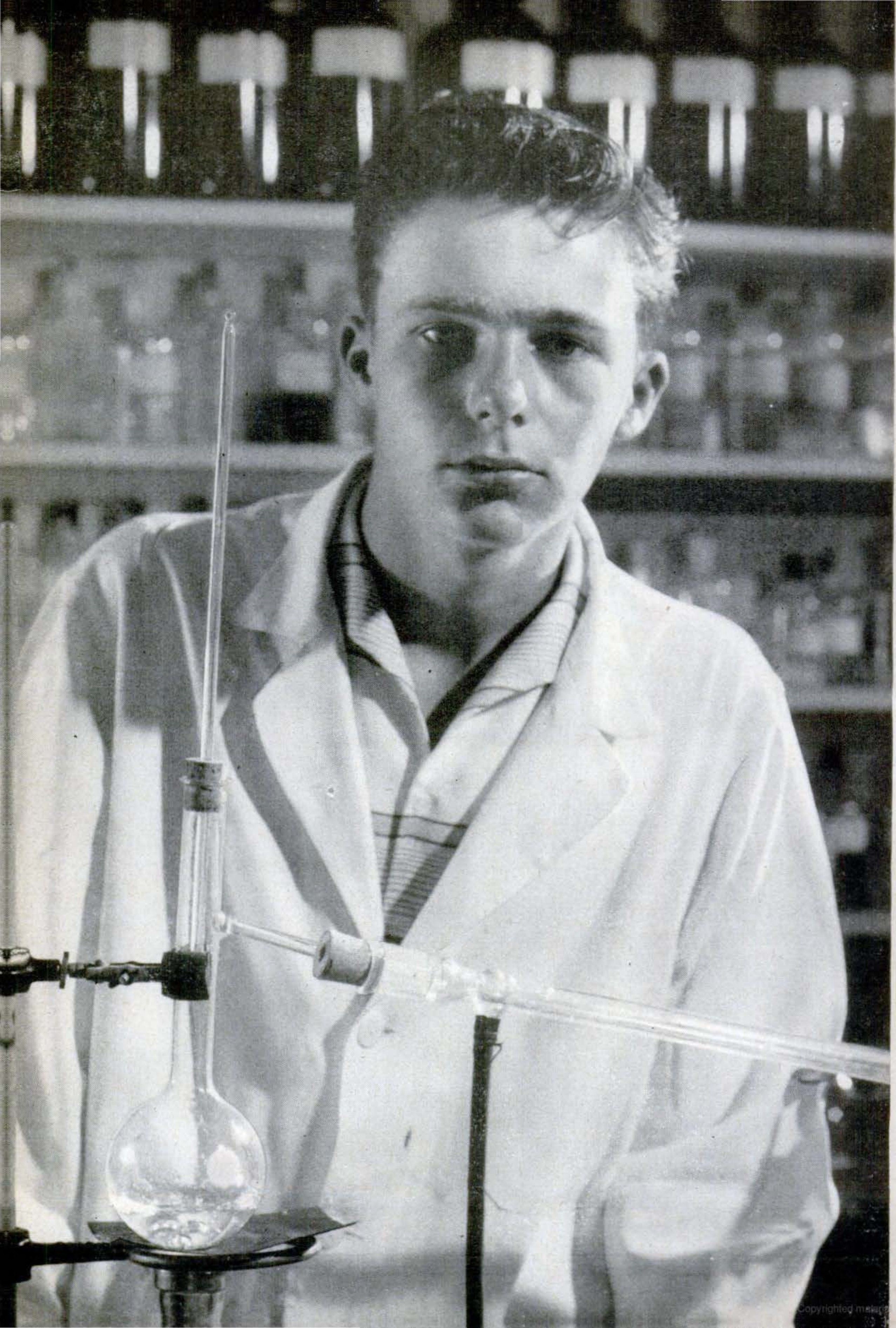

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How Good Are the Science Labs in Your Youngster's School ?

Good laboratories teach a priceless skill: How to figure things out. Here's a yardstick to measure your school

By John Kord Lagemann

IMAGINE trying to teach your child how to swim without getting him wet. That's no sillier than trying to teach him science without giving him a chance to experiment in a laboratory.

Why? Because science is not solely a great bundle of organized facts, like some other studies. It is, in addition, an exercise in the use of a sharp-edged detective tool—the scientific method.

The scientific method is one of the all-time great achievements of the human intellect. It is a way of thinking, a wondering, skeptical, I'm-from-Missouri attitude. And it is a way of finding things out, the don't-go-by-the-book, let's-try-it-and-see operation.

Without it, you'd be back behind a horse-drawn plow. With it the whole wonderful world of modern civilization has been built. The scientific method is not just for scientists. Your youngsters can use it constantly to find answers to problems of everyday life—buying a car, choosing a job, even voting.

The guidance director of a Midwest high school told me, "You can spot the science students when youngsters come in for counseling. They have learned from experience how to organize their thoughts, define their goals and weigh the facts before making up their minds."

If you want your children to grow up with qualities like those, they need laboratory training.

Are they getting it? Unfortunately, laboratory instruction is perfunctory in many American high schools, nonexistent in some. It is totally lacking in most elementary schools.

According to a survey by the U. S. Office of Education, one out of four high schools tries to teach chemistry without a laboratory. The same is true of physics. Only three out of five schools provide lab work with their biology courses. In junior high, only about 40 percent of the ninth-grade general-science courses include lab work, and the figure drops further for the seventh and eighth grades.

Other studies indicate that, today, more attention is being given to laboratories. But the lack is still serious, particularly in the small schools which educate substantial numbers of American children. It is an educational deficit second only to the shortage of science teachers.

The teachers themselves are alarmed. Robert H. Carleton of the National Science Teachers Association pulled no punches when he said recently, "It's time we stopped cheating our children. The child who receives no lab instruction in science is being betrayed as surely as if the school had taught him half-truths."

How about your youngsters? You don't have to be a scientist to find out nor a politician to do something about laboratory training for your children. The labs in your schools can be judged by simple, non-technical standards. If you find improvements are needed, your local PTA and other civic groups can work with school authorities to provide them.

There are three questions to ask:

PHOTO BY W. W. MORRIS

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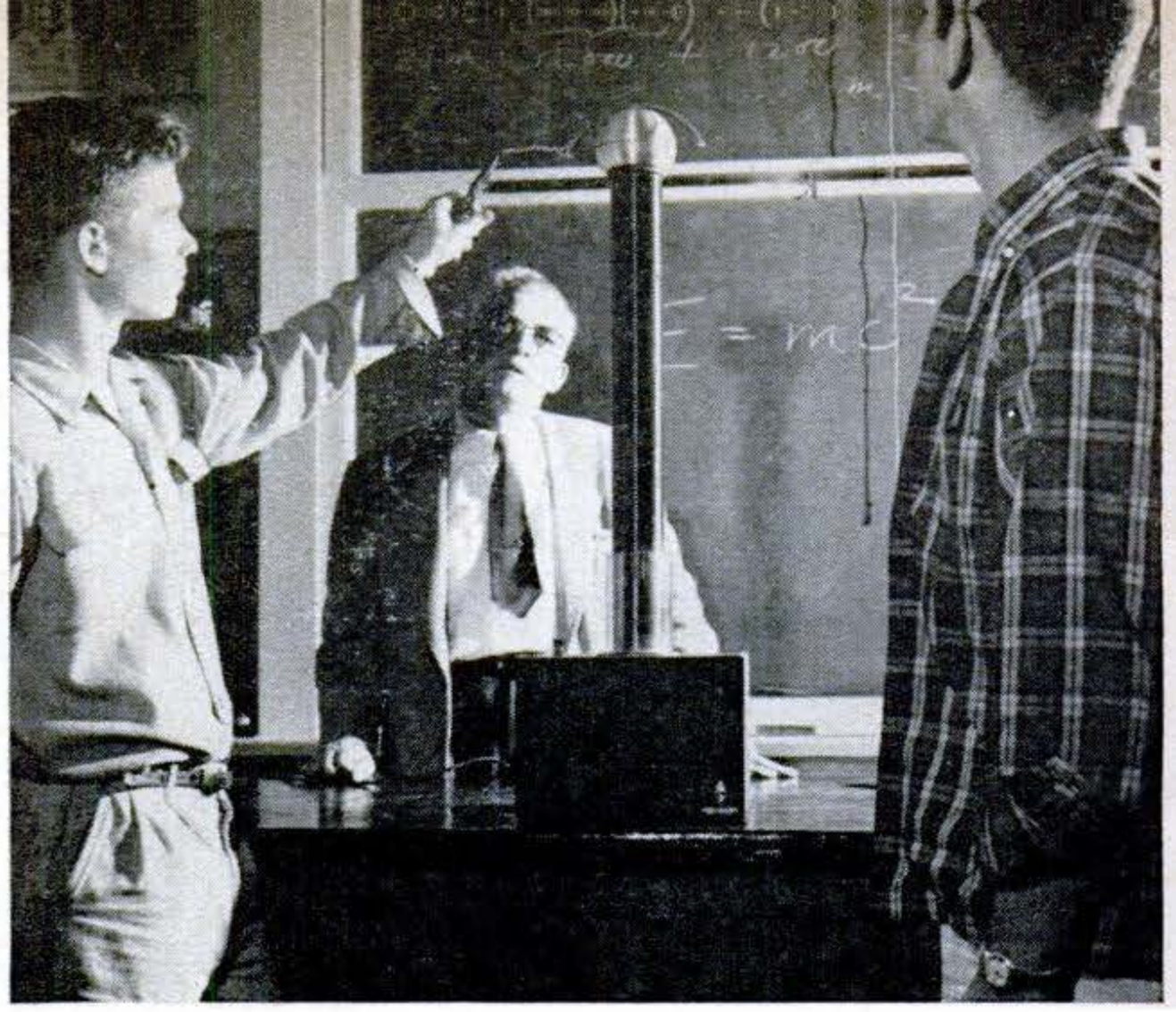
Atomic-age physics lab: Could this be your school?

ATOM-SMASHERS AND CLOUD CHAMBERS in school labs? Absolutely. Today's youngsters must learn today's science. They start with the atomic picture of the universe. In many schools, students build simple nuclear instruments. Others make use of moderately priced working models that are now becoming available. At right, Berkeley (Calif.) High senior Ed Miller pulls sparks off a high-voltage generator while Dave Newsom and teacher M. Van Waynen observe. The two 17-year-olds are watching for the thin streaks of cosmic rays in a cloud chamber in the center photo. At far right, Pete Piatkowski, eight, assembles a small Van de Graaff machine from a kit. These instruments are made by Atomic Laboratories of Berkeley.



• Is laboratory work a regular part of every science course?

• Are facilities adequate?

• Are teachers using the facilities to give the training your youngsters need?

Don't accept such brush-off answers as "We can get by without labs," or "We can't afford them." Your youngsters *can't* be properly educated without lab experience. And the expense need not be as great as some educators appear to believe.

A place to experiment. Oddly enough, while the cost of lab facilities frightens many school administrators, others are snowing the children under with nonessential equipment. Not only does this waste public funds—your money—but it actually interferes with proper training.

There are some basic things your children must have: workbenches with sinks, and utilities—gas, electricity, water.

These do cost more than the desks that outfit a history classroom. But the expense is not out of line with what most schools spend on athletics and band instruments.

Beyond this basic investment, elementary and high-school labs don't need very much at all. That is the startling conclusion of the Physical Science Study Committee, a group of 65 of the nation's top scientists and educators who are now working out a radically new approach to physics instruction.

Dr. Elbert Little, executive director of the committee, told me, "There is no essential piece of equipment which a science teacher and his students can't build out of cheap materials readily available in any community. Apart from the initial outlay for the plant, the cost of laboratory equipment and supplies need run no higher than $10 per student."

Dr. Little's committee is concerned about economy, of course. But that's not the main reason for its interest in build-it-yourself equipment. Youngsters learn more when they design and build the apparatus they need for experiment.

The committee's experts have shown how many useful laboratory instruments can be contrived from such odds and ends as rubber bands, pins, razor blades, soda straws and marbles. For instance: A stroboscope to "stop" rapidly rotating machinery was made from tongue depressors, a tin can, a snap fastener and wire; a balance that will weigh 1/300,000 of an ounce (the mark left by a pencil is that heavy) was made from straws, wood and pins; and a rangefinder more accurate than a $40 camera accessory was made from wood, mirrors and string.

Since fancy ready-made equipment isn't always necessary or even desirable, you can tell more about the quality of your schools' lab program by asking *how* it makes sure your children have the things they actually need:

• Do students build much of their own apparatus? The Physical Science Study Committee's lab manual is not yet published, but other books and magazines describing homemade equipment are available. (For example: the UNESCO *Source Book for Science Teaching*, com-

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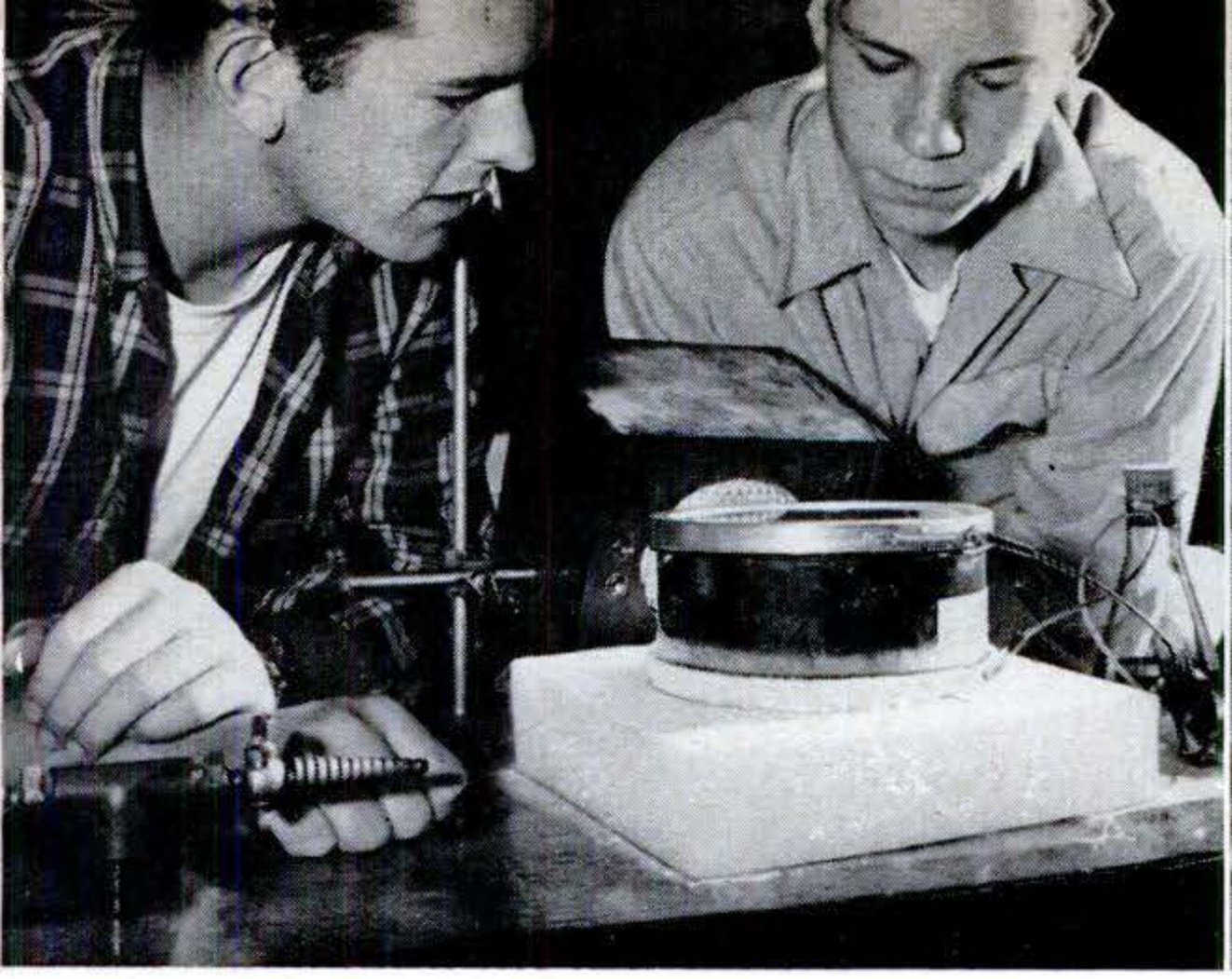

piled by Dr. Ellsworth S. Obourn of the U. S. Office of Education and available for $3 from UNESCO Publications Center, 801 Third Ave., New York 22, N. Y.)

• Does your school share expensive equipment with others nearby? Often, several schools pool their funds, then take turns using the apparatus.

• Are touring demonstrators—such as the Atomic Energy Commission's "Traveling Science Teachers"—invited to visit?

• Is the outdoors put to work as a natural, living laboratory? Students can cultivate garden plots on the school grounds, study wildlife in parks and nearby woodlands. They'll learn far more from wheat in the field or a wren in a tree than from dusty specimens in a cabinet.

What kind of lab work? The answer to this question, regardless of facilities, is what determines the value your youngster gets out of his science studies. There are two kinds of experiments:

The "cookbook" method tells your youngster exactly how to go about finding out something he knows already. One that I remember from my high school days: Prove that water boils at 212° F. by putting a thermometer into some steam.

The problem method forces your youngster to figure out the answer in his own way. For example, he may be handed a vial of liquid and told to identify the chemicals it contains. Neither his teacher nor the lab manual gives him step-by-step instructions for the analysis. He's on his own, learning the scientific method.

I saw what the problem kind of lab teaching can do one warm June day when I visited the third-grade classroom of a Long Island (N. Y.) school (*third* grade is correct; they can't start too young).

A nine-year-old boy wondered out loud, "How come dresser drawers stick in the summer, but not in the winter?"

From across the room, a pigtailed blonde theorized, "Things expand when they get hot. It's hotter in summer."

The teacher didn't say, "No, that's wrong." She didn't say, "Let's look it up." She said, "Let's find out."

The boys bored holes in two small pieces of wood, then slide-fitted the holes with doweling.

The girls took the samples to the lunchroom kitchen and put one piece in the refrigerator, the other in the oven.

[Continued on page 258]

Next Month: How Good Are School Shops?

The good jobs today are waiting for the skilled workers. Your youngster should be able to begin preparation for these promising careers in high school. Can he? Does the school system in your town provide the training? Is it the right kind of training? You'll see how to find out in the December PS report-in-depth on school shops.

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Three hundred yards aft the P6M in a Navy FJ-2, chase pilot Brown said, "All clear, Bob." The dive would be the payoff for the fix on the P6M's tail.

The Fortunate Disaster of the P6M

By Eliot Tozer

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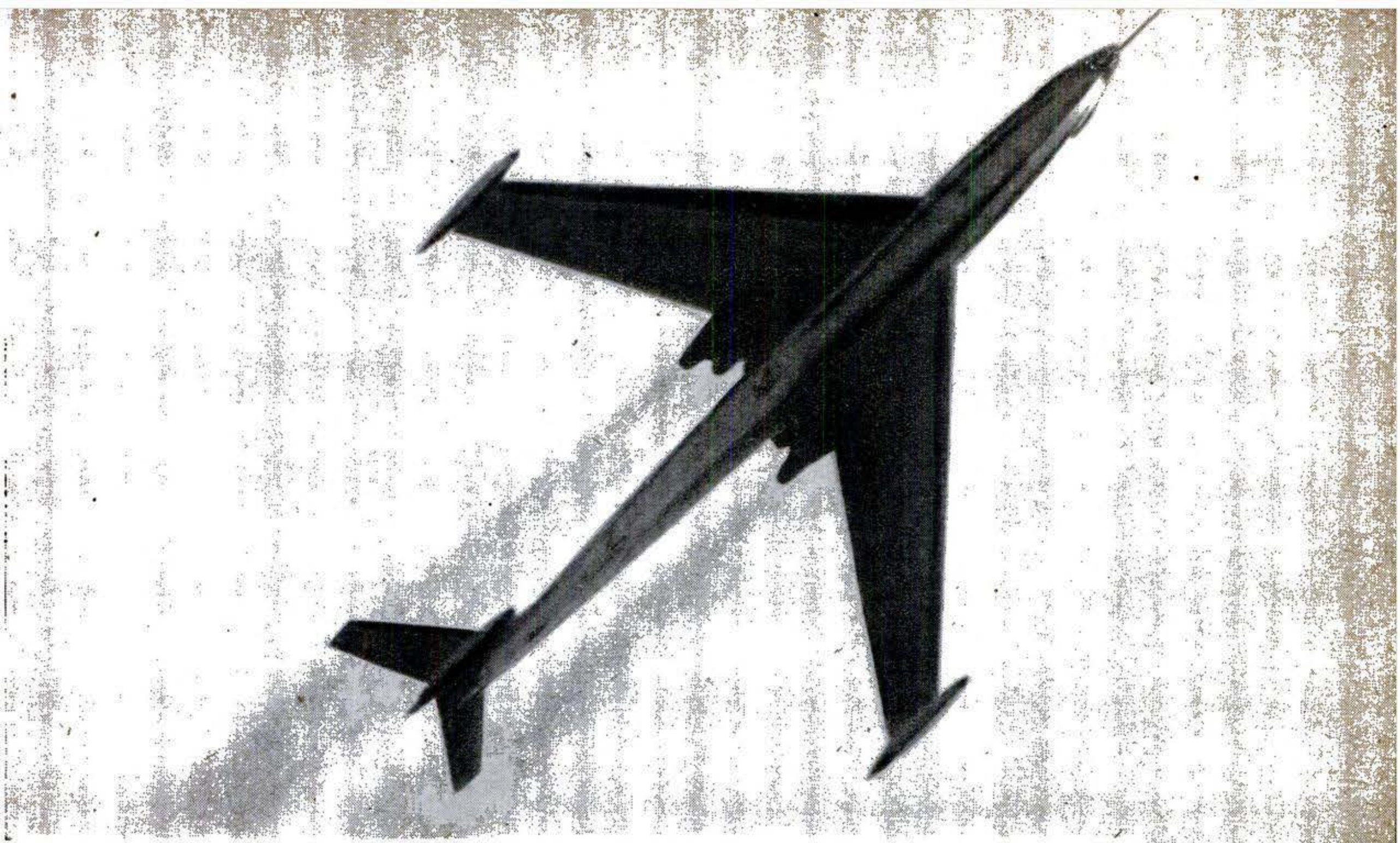

AT 2:15 P.M. on November 9, just one year ago, Bob Turner, test pilot on the hottest flying boat in the world, flashed an "all clear" to the crew on the launching gear and P6M No. 2 eased off her cradle into the choppy waters of Chesapeake Bay. Turner racked her throttles forward. The four Allison J-71s roared a crescendo of power, their jet exhausts dimpling the water, and the long, sleek P6M sliced gracefully through the chop toward takeoff position.

Gently, Turner felt out the SeaMaster's controls. He eased back on the yoke and the "flying tail" perched atop the fin responded smoothly. Perhaps, he thought, the new fix on the tail would knock out the shudder that had been shaking up the big boat at near-sonic speeds.

Turner ticked off the items on his check list, making every move with deliberate caution. For this flight, as on all flights, the SeaMaster's deck was crammed with special recording instruments. Their readings would be telemetered by radio directly to the monitor room at the Martin Airport in Baltimore.

In the monitor room, the instrumentation engineers checked their Sanborn recorders. One man flicked on the Brown recorder; it would take 144 individual readings. Before the flight ended, they would tape four miles of recordings. Over in the communications section, 17 channels were tied into the monitor

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Now the hull was almost vertical . . . Slowly, inexorably,

room, the tower, the chase plane, and the four men in the missile-like P6M.

The monitor room was crowded, but quiet. Most of the men were engineers who wanted to watch the oscillographs and "see" the plane shudder when Bob Turner grooved toward the earth in his near-sonic dive.

George Rodney was there. He had been test pilot of the first of this new breed of flying boat. Later, he had been in the monitor room when it had flipped unexplainably into an outside loop and disintegrated, killing all four men aboard.

There were other watchers. Out at the seaplane ramp, high Navy brass stamped their feet against the November cold and waited for the huge P6M to cut in her after-burners and thunder off the bay. Anxiety was etched deeply into their faces because the time had come for a showdown. After 24 flights, P6M No. 2 was almost ready for her acceptance tests—yet no previous fix had been able to stop the shake.

It was time for a showdown in a more vital way. One important chance for survival of the Navy's air arm rode on this P6M. Some strategists said that naval aviation had become obsolete in the jet age. The Strategic Air Command, they said, could attack the Eurasian land mass without the help of Navy planes. Land-based Air Defense Command interceptors could defend the shores of the U. S.

But Navy airmen disagreed. They pointed to Field Marshal Montgomery's recent statement that the world's navies may be the only striking forces left after the opening salvos of an atomic war. If so, squadrons of P6Ms, hidden in remote bays, could carry on the atomic fight.

The SeaMaster could also fight a nasty war of harassment, dropping mines by parachute into enemy shipping lanes and knocking off enemy subs, then dashing back to its hidden coves at 600 m.p.h.

Bob Turner knew all this. It showed in the tight lines along his jaw as he called out the last of the 50 items on his takeoff check list. He pressed his intercom button to call Bill Compton, flight engineer, and Tom Kenny, flight test engineer. Both gave him an "all clear." A quick glance showed co-pilot Bill Cunningham was ready.

2:44 PM Turner poured the coal to the four Allisons and the P6M strained forward. In seconds, she was thundering across Chesapeake Bay. Turner held the yoke steady. You don't have to horse this baby up on the step or rock her to break the suction of the water. The radically designed P6M is as sleek as a PT boat.

Turner eased back gingerly on the yoke and the porpoise-shaped nose of the P6M reached for the sky. Now, with the Allisons screaming, the milky foam of the P6M's wake spewed aft in violent whirlpools. A final touch on the yoke and she broke for the blue.

2:50 PM "I'm taking her back over the airport," said Turner over the intercom. "The Navy wants to hear if she's noisy at 5,000 feet."

In the aft end of the pressurized flight deck, Tom Kenny bent over his desk and scribbled in his flight log. Something was wrong with the cabin pressure system. He smiled as he thought how he'd ride Operations Manager Tom Ray.

2:58 PM At 12,000 feet, Bob Turner reached for the toggle switch that actuated the rotary mine door in the P6M's hull. The door, cut spang in the middle of the keel, was perhaps the most important single development in this new water-based attack weapon. With a flip of the switch, the pilot could open a long section of the hull. Inside, 15 tons of destruction could be hung. Turner hit the toggle again and the door rolled closed, the pneumatic tubes automatically sealing the hull watertight again. For good measure, he rolled her open again. Not a quiver.

3:07 PM The P6M bored eastward through the Maryland sky at 25,000 feet. She could climb to 50,000, but for this test the engineers wanted Turner to hit a specific Mach number at 20,000 feet. To do it, he would nose over into a dive until he hit his point, then hold it down through 20,000 feet. The dive would be the payoff for the fix on the P6M's tail.

The P6M's entire stabilizer moves up and down when the pilot pulls back on

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the yoke. The elevators attached to the stabilizer ordinarily also move, acting as a secondary force changer. But for this test, the engineers had locked the elevators in place. Only the stabilizer would move. The hydraulic valves in the control system would have to sustain all the load of any maneuver.

3:09 PM Bob Turner pressed the mike button on the yoke. "We're at 25,000 over Tolchester Beach."

"Ready here," said Monitor Room.

Tensely, the chief instrumentation engineer walked again down the line of recorders. They hummed quietly. "Get set," he said.

Chase pilot O. F. Brown, flying an easy 300 yards aft the P6M in a Navy FJ-2, said, "All clear, Bob."

Bob Turner tugged at the faceplate of his helmet. He paused, his eyes sweeping once again over the bank of instruments in front of him. Then, he nosed the P6M earthward. The long, beautifully shaped hull slipped cleanly through the thin air. In seconds he was on his point.

He played the yoke, fighting to stay on his point. "I'm on point at 410 knots," he said to Kenny. "Record it."

"Got it," said Tom Kenny, pressing the buttons that triggered the two cameras for the 50-instrument photo panels.

"On point at 415," said Turner.

"Got it," said Kenny again.

At 20,000 feet, the SeaMaster's speed began to build. In the monitor room, George Rodney watched the telltale jump on the oscillographs. As a pilot, he was more tense than the rest. It's building up fast, he thought. Should he call out to Monitor? Should they instruct Turner to cut it off the way he had been instructed so often when he drove his plane too close to the edge of danger?

But the needles quieted as the speed tapered off. Rodney breathed deeply.

Then Turner's voice came in. He was jubilant. "Real smooth all the way," he said. "No vibration at all."

The mood of the monitor room changed. Everyone smiled and a wave of excited chatter rose. The fix on the tail had killed the shake. For the first time in seven months, the engineers were getting the readings they wanted.

3:24 PM "What's your position now?" asked Monitor.

"Over the Bay Bridge."

The P6M was knifing through the cold November sky at 400 knots.

"Okay," said Monitor, "try it once more, Bob. This time, kick it up almost to Mach one at the same altitude."

Once again he nosed the giant P6M down five degrees. It was not easy to hit the Mach number. He jockeyed the yoke. In today's red-hot aircraft, the hydraulic boosters take much of the natural feel out of the control system.

Then he hit his point. "On point at 415," he breathed. "Record it."

"Got it."

"On at 420."

"Got it."

One more five-second recording as they hurtled past the 20,000-foot mark, and then Bob Turner eased back on the yoke. The huge P6M, hope of the Navy, responded at first and came almost back to level flight. Then she "tucked under" —dropped her nose in an unexpected dive. It was almost exactly like the tuck that Bob Turner had felt dozens of times in other aircraft when he had flown them through the sound barrier—but not quite.

Turner pulled the yoke back. The SeaMaster waited, then slowly lifted her nose and he felt the tension drain out of him.

3:31 PM Then it happened. There was no clap like the buckling of a fuselage. No warning through a yoke gone suddenly mushy. No sudden flick of an instrument needle. But the P6M was unexplainably climbing.

She climbed slowly at first, then faster and faster. Puzzled, Bob Turner tried to figure why as he pushed the yoke forward. The P6M kept reaching.

His eyes swept the panel. Everything was still normal. But the P6M continued her dangerous climb into the blue. He thrust the full strength of his stocky arms against the yoke.

Bill Cunningham looked over at Turner in wonderment, then scanned his instruments. He instinctively reached for his ejection face curtain.

Now the slim grey-and-white hull was almost vertical. Turner's arms were

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straight out, his entire body thrown into his desperate heave on the yoke. The G-load was intense; his guts were drawn downward and the grey mist of blackout crept up over his eyes. Slowly, inexorably, his head was driven down onto his chest.

3:31:30 PM An explosion shook the flight deck, and suddenly the cockpit was filled with a strange light. A quick mist swirled through and evaporated. Dust and debris boiled up and clouded the instruments.

Into Turner's ears came the rasping cry of Brown in the chase plane: "P6M, you're breaking up. Bail out."

The leading edge slats had peeled off and whipped aft in the slipstream.

Without thought, almost without motion, Bob Turner reached up and pulled the face curtain . . . and all was serene. He was clear of the plane, rolling gently through the quiet sky. Silently, he fell earthward, spinning first in one direction then another. The seat dropped away from him and he knew that in a moment his chute would open automatically. In the distance he saw Cunningham. The explosion had been his ejection-seat cartridge going off.

In the plane, Bill Compton had felt his body being driven downward toward his desk. He had heard the chase plane's cry and felt the cabin depressurize. He too reached up, and his ejection seat hurled him into the November sky.

Tom Kenny, new to the P6M's crew, was the last to go. The plane, her cameras and all her telemetering gear still faithfully ticking away, had arched over on her back before he knew what had happened. Now, perversely, she started to level out in the inverted position, throwing Kenny violently against his seat belt. He touched the face curtain. Only when his chute had opened did he realize that he had ejected from an 80-ton airplane pulling nine Gs in a loop —with a pencil in his hand. He dropped it into the swampland.

A minute after the last man was out, a sunburst of bright orange flame lighted the sky as the only P6M in existence exploded at 7,000 feet.

3:32 PM In the monitor room, the pens of the recorders danced crazily. In fascinated horror, the engineers watched them, knowing that they told the death of a P6M in mid-air. Then the voice of the chase pilot shattered the stillness: "I've got three . . . no, four chutes. Three of them should go into the swamp area and the fourth one to the south of it."

George Rodney raced out of the room and down the tower stairs. In minutes, he had whipped a crew into helping him launch a bulky P5M and had taken off downwind for the swamps. Even so, Air Sea Rescue Service at Atlantic Beach got there in an SA-16 before he did. By 8:00 p.m., all four crewmen were back at Martin and had recorded their statements.

During the night, search crews painstakingly felt their way through the fields and swamps until they had found every cartridge of recording film and tape. Before dawn, they had been rushed to the Eastman Kodak laboratories for special processing. But Eastman technicians, knowing their crucial importance, suggested that the cartridges be sent to the FBI development labs.

At the same time, over 100 Martin technicians were investigating the crash. About 95 percent of the wreckage was found; parts of it were spread over a 15-square-mile area. Weeks later, after the readings on the tapes had been run through a battery of electronic computers, Martin knew beyond question of doubt why the P6M had suddenly clawed upward in her wild inside loop. Technically, the locked elevator had set up such high moments of force that the hydraulic boost actuator had failed, and the yoke had been useless in Turner's hands.

Ironically, it was the successful fix that led to disaster.

The dramatic mid-air crack-up and bail-out, which might have spelled the end of the SeaMaster project, brought instead a solution. The tapes proved that the big problem—the high-frequency shake—could be licked by modifying the tail. Martin is installing a completely redesigned tail on the P6Ms it will deliver to the Navy next year. By 1960, six YP6M-1s and 18 P6M-2s—$82,000,000 worth—will have been built, for the first water-based attack bomber squadron in history. END

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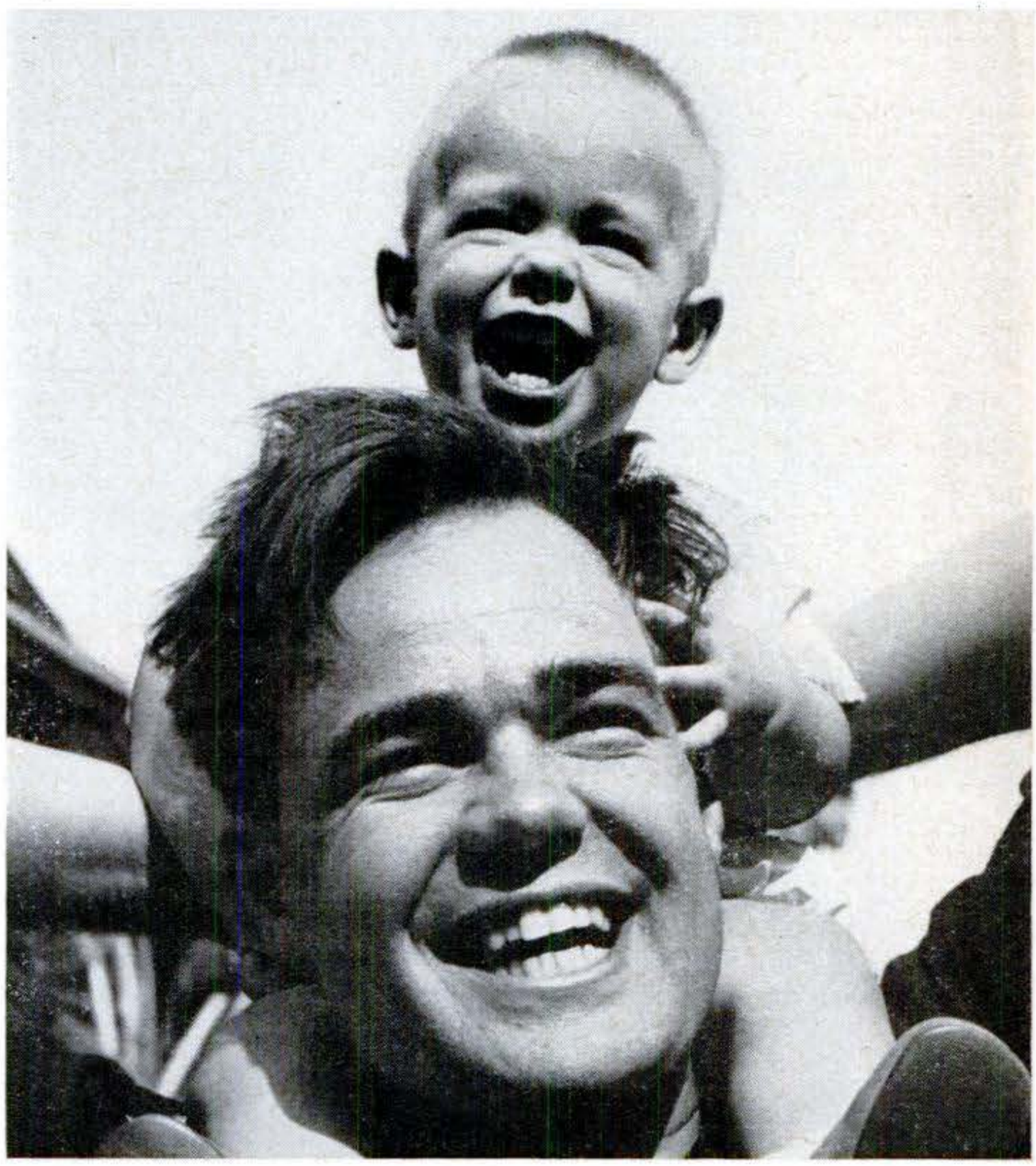
How Much Like You Will He Be?



Science is learning some surprising things about the strange gamble of heredity—and which of your traits you will probably pass on to your child

By Herbert Yahraes

YOU reach down, pick up your young son and swing him high in the air. He looks at you wonderingly. And suddenly you find yourself wondering, too.

What lies ahead for the little guy? What kind of man will he grow up to be? How smart? What likes and dislikes will he have? What skills?

He seems to have inherited his mother's eyes. Has he inherited her musical ability, too, and her amiable disposition? He seems to have his father's hair. Then will he have your bent for mechanics, your way with a football?

Or doesn't heredity count in things like that? Is the important point not what he was born with but how you help him to grow up from now on?

Geneticists have learned a great deal about the inheritance of such characteristics as the curliness of people's hair, the color of their eyes, and their predisposition to certain ailments. They

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What We Can and Cannot Inherit

Some characteristics listed here, notably blood type, are entirely determined by heredity. But for most of them heredity plays only a part. A person might inherit

Characteristic	Yes	Probably	Possibly	No	Remarks
Aggressiveness			✓		
Alcoholism				✓	
Arthritis	✓				
Artistic talent		✓			
Blood pressure		✓			
Blood type	✓				**exclusively**
Cancer susceptibility			✓		**yes, for some rare forms**
Color blindness	✓				**almost exclusively**
Courage			✓		
Crossed eyes	✓				**almost exclusively**
Curly hair	✓				
Diabetes	✓				
Dimples	✓				
Emotional stability		✓			**in part**
Eye color	✓				**almost exclusively**
Finger length	✓				
Food, tastes in				✓	
Gestures				✓	
Hairiness	✓				
Hay-fever susceptibility		✓			
Head shape	✓				
Heart-disease susceptibility		✓			**certain types**
Height	✓				**also affected by diet, etc.**
Intelligence	✓				**influenced by environment, too**
Longevity	✓				
Math talent	✓				

know less about how and whether you pass along intelligence, aptitudes, and personality.

But they do have evidence now that almost everything a person is—his mental and emotional makeup as well as his physical—can be attributed in some part to heredity.

Heredity is a great gamble. Your genes, numbering perhaps 20 or 30 thousand, are represented twice in each of your body cells. They are partners, one member of a pair occupying a certain spot on a chromosome and the other occupying the same spot on a duplicate chromosome. They work together to influence a trait, by controlling chemical reactions.

When a new individual is formed, he gets one partner of each pair from his father—*which* partner is a gamble—and the other from his mother.

Given enough information about you and your family, geneticists can quote you odds on some other heredity propositions—for example, against your child's being born with clubfoot, or with Rh-negative blood, or with a tendency to diabetes. Many such traits are controlled largely by one gene in a partnership.

As for personality and behavior, though, no such control has been found.

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genes that make him susceptible to an ailment or give him a capacity for a particular talent. But he'll never develop ulcers or become a great musician unless everyday life moves him toward that pattern. It's not certain, either, whether he will pass these particular genes on to his first, second, or any subsequent child.

Characteristic	Yes	Probably	Possibly	No	Remarks
Mechanical knack				✓	
Mental deficiency		✓			**some types**
Money		✓			
Musical talent		✓			
Near- or far-sightedness		✓			
Nose shape		✓			
Obesity		✓			**to some extent**
Pain sensitivity				✓	
Personality				✓	**to some extent**
Polio susceptibility				✓	
Rheumatic-fever susceptibility		✓			
Schizophrenia			✓		**evidence not clear**
Scientific talent			✓		
Self-confidence				✓	
Sex drive				✓	
Shyness				✓	
Sociability				✓	
Sports talent			✓		
Sunburn susceptibility		✓			
Teeth, shape of		✓			
Teeth, susceptibility to decay				✓	**early diet, care important**
Temper				✓	
Tuberculosis susceptibility		✓			
Twins, tendency to have		✓			
Ulcer susceptibility				✓	**evidence not clear**
Writing talent			✓		

In fact, if it weren't for a special case—identical twins—scientists would still be doubting that the genes had anything at all to do with it.

Why *identical* twins? Because they've developed from the same fertilized egg, so they have the same inheritance. *Fraternal* twins, on the other hand, have developed from two separate eggs fertilized by two separate sperm, so their inheritance is no more alike than if they had arrived years apart.

When fraternal twins, or ordinary brothers and sisters, differ in some trait, there's no telling why; but if identical twins differ, the answer must lie in environment, either pre- or post-natal: Their circumstances in the months before birth may not have been exactly the same. Or possibly there has been some difference—scarcely noticeable—in the way they've been brought up.

Fortunately for the science of genetics, every once in a while a pair of identical twins is separated early in life.

Some years ago, for example, two identical twin boys were adopted by different families shortly after their birth and were brought up in quite different circumstances. One lived steadily in Salt Lake City and went through high school. He had a sister. The other wandered

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around the country with his foster parents and eventually landed in New York City. He went only a while to high school. There were no other children.

Yet when the two met as young men they showed remarkable similarities. In two I.Q. tests the high-school graduate scored 104 and 101; the other 97 and 98. Both were weak in math. In many cases they missed the same questions.

They got almost identical scores on a test measuring such personality traits as speed of decision, self-confidence, and interest in detail.

One boy was particularly fond of music; the other, of drawing. They both liked sports. Amazingly, both had boxed in public and won championships.

Geneticists and psychologists have studied many other such cases. They have also observed identical twins who have been brought up together, and they have studied what happens when foster children of one intelligence level live with families of a different level.

You do inherit intelligence, they have found. Identical twins usually show only very small differences on I.Q. tests except when there has been a great difference in the twins' schooling. For instance, a girl who had been brought up on a farm and gone only through eighth grade scored 89, while her identical twin, who had lived in a small town and gone through high school, scored 106. In conversation, though, the country girl seemed just as intelligent as her twin. Besides, the difference of 17 points was no greater than you yourself might show if you were tested at two different ages.

In almost every case like this, the twin who has gone to school longer shows a higher I.Q. So, although you do inherit your brain power, your ability to use it to get a high score on a formal test depends partly on your education.

Orphans demonstrate what can happen. When they're adopted into good homes, studies show that not only their personality blossoms out, but their intelligence too. Children of apparently mediocre intelligence will close about half the gap between themselves and their foster parents. For instance, if a child's I.Q. is 80 while that of his new parents is 120, another test within a few years will probably show him at 100. We can't change our heredity, but we can do a lot about how we use what we've inherited.

If you and your wife are both bright, your children are likely to be bright, too. Some may have higher I.Q.'s than you, some lower—and there's no way of predicting how smart any given child will be—but the average intelligence of all of them will usually be about the average of you two.

There's an exception. Parents with a very high average may have children averaging not quite so high. As Dr. Gordon Allen, a geneticist with the National Institutes of Health, explains it, this may be because the high intelligence of the parents was determined in part by their environment, which they probably cannot duplicate for their children. For example, the circumstances that forced you to take a job in order to finish your schooling may have been more advantageous—as far as pushing up your I.Q. goes—than the circumstances that will permit your son to take things easier.

This works the other way, too. Parents with an I.Q. below average may have been held down by a lack of opportunity rather than by an inherent weakness in intelligence. They could have children whose I.Q.'s are average or above.

Because heredity *is* such a magnificent gamble, you may have a musical, artistic, mathematical, or other type of genius among your children even if you and your wife are not so gifted.

Geneticists theorize that a genius arises when all the necessary genes—perhaps dozens are involved—have come together in one person quite by lucky chance, and when this person also has the urge and the opportunity to develop in accord with his capabilities. You may have inherited some of these genes and your wife others but, lacking the whole set, neither of you sets the world afire. It just could be that your little guy got them all.

Genius seems to spring up spontaneously but *talent* often runs in families—shaped in part by the genes but more by family atmosphere and family traditions.

Your boy will get his love of nature from his old man, all right, but he'll get it in large part because the old man will take him on walks and camping trips and point out some of the fascinating aspects of nature.

And if your boy turns out to have a

[Continued on page 260]

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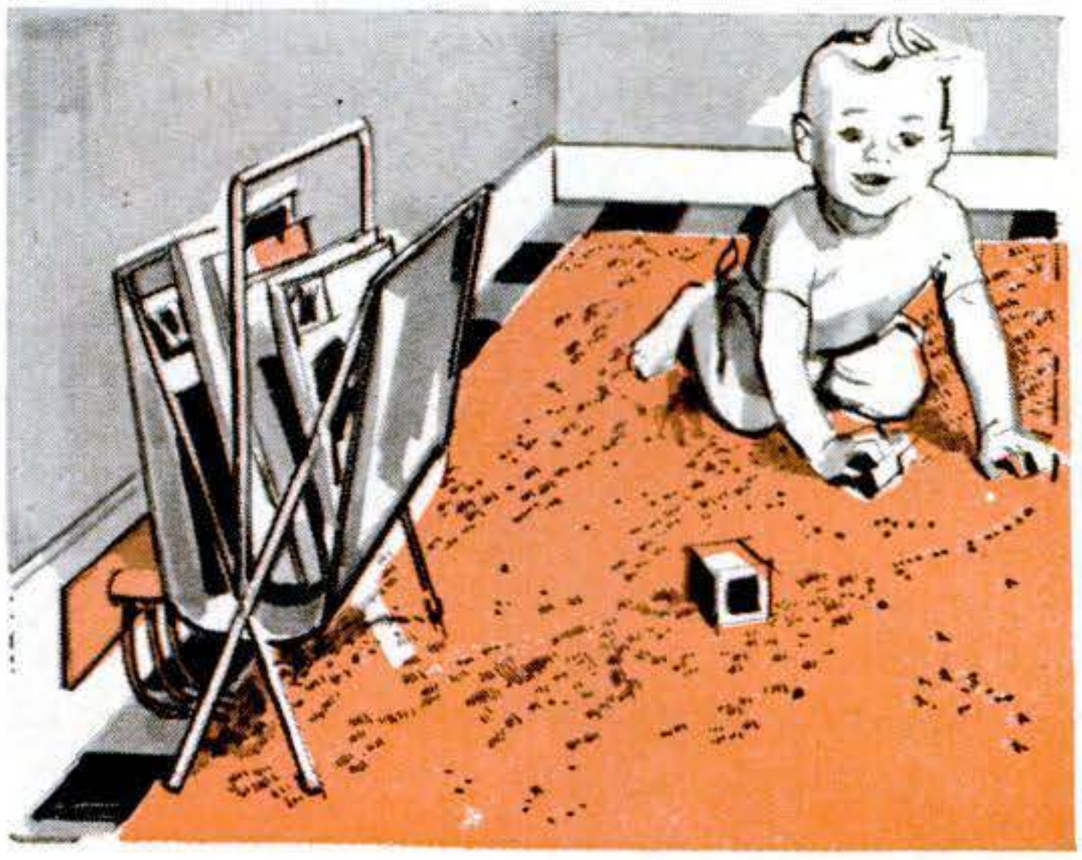
New Ideas from the Inventors

1 Roadside Posts Warn Speeders. Superhighways would be safer, says this inventor, if they didn't lull motorists into driving too fast. To alert careless speeders, he'd arrange parallel rows of posts in a way that would give a passing driver an exaggerated sensation of speed and remind him to check his speedometer.

2 Carpet Heats the Room. Similar in effect to built-in slab-floor heating coils, this electrically heated carpet might be used to warm a room or merely to take the chill off a child's play area. Its electric coils would be safely embedded in the rubber base of the carpet.

3 Washer Meters Its Soap. With this timed powder dispenser on her automatic, a housewife could load clothes and detergent at the same time and then forget her wash. After sitting out the preliminary rinse, the powder would be floated in by incoming wash water.



Please turn the page for more new ideas

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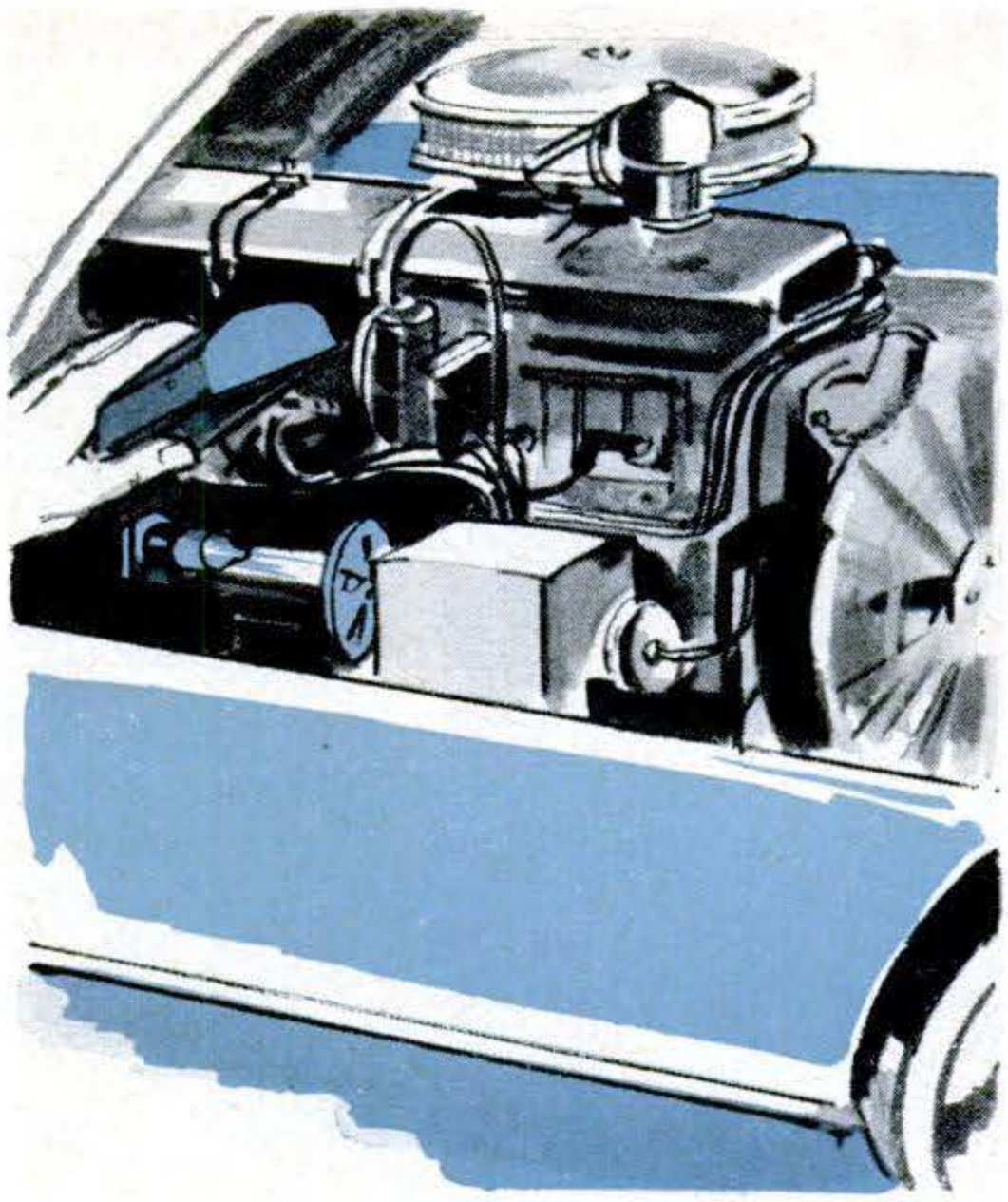
More Inventors' Ideas



4 Electric Trigger Improves Aim. Squeezing this trigger would close a switch, so the action could be smoother, lighter, and more uniform than that of a conventional firing mechanism. A battery-charged capacitor would build and store the hefty voltage needed for firing.

5 Light Beam Sparks Engine. In this electronic ignition, a photocell—and a light beam to trigger it—would replace distributor and breaker points. A slotted disk or shield rotating between the light and photoelectric eye would time the "contacts" and serve as a distributor.

6 Box Stretches Cab Bed. A long-legged driver could catch forty comfortable winks in the cab of this truck by opening the folding box built into the door. Forming an extension of the seat, the box would provide ample stretch-out room and protect both the cab and driver from the rigors of cold or wet weather.

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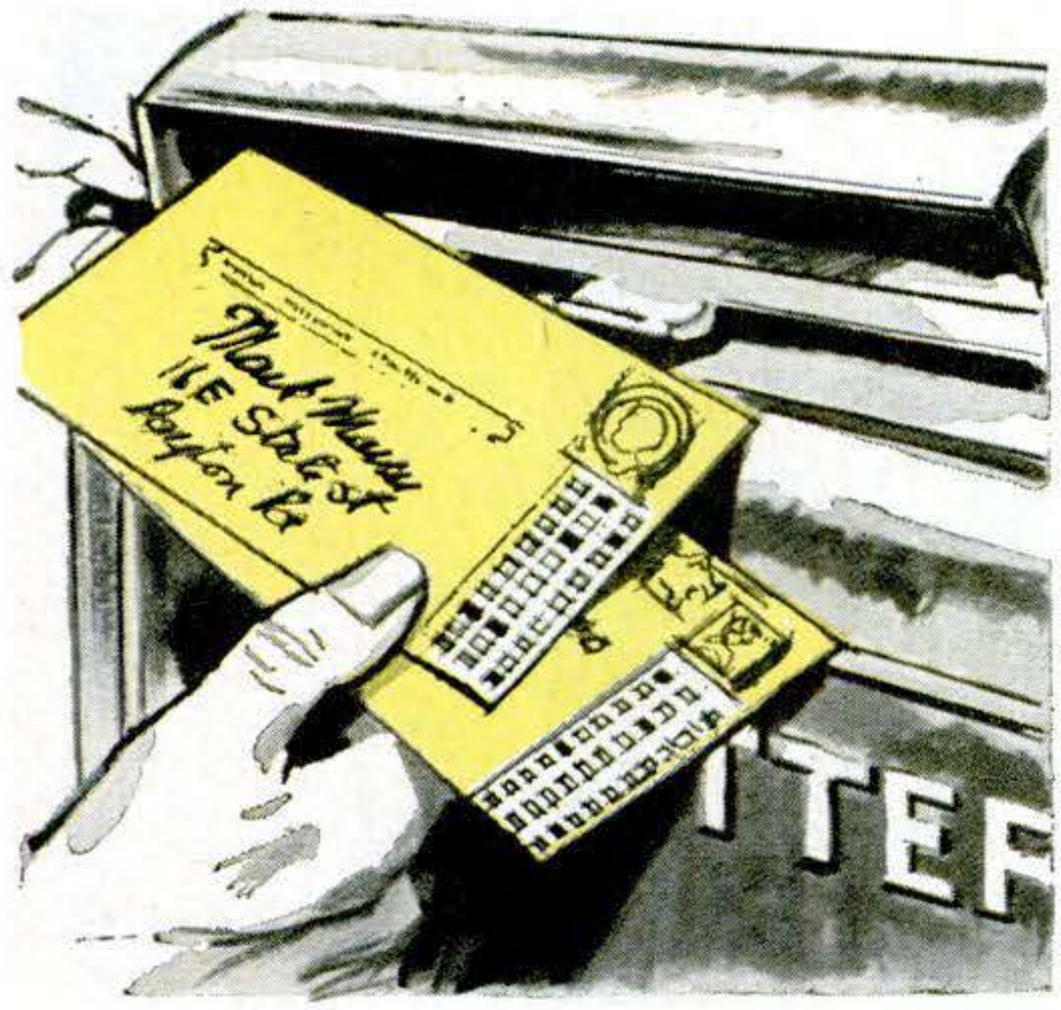
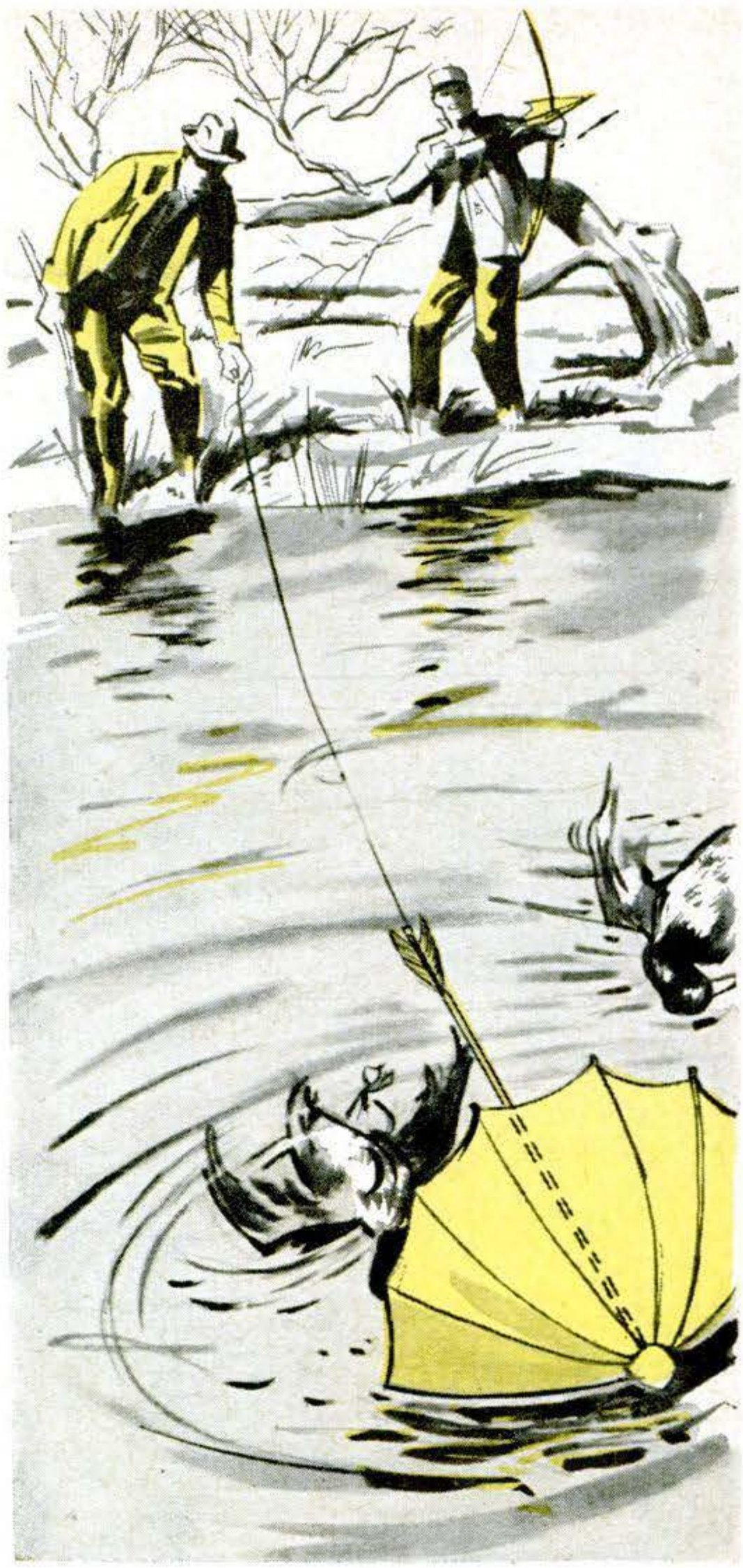
7 Tear Strip Opens Bottles. You'd have a hard time forgetting to carry an opener for these bottles, because you uncap them with your fingers. Each stamped-metal cap would have several elongated tabs you could pull up when you wanted to loosen the cinched grip.

8 Envelope Code Speeds Sorting. Bulk mail could be handled faster if it were separated automatically. Tiny boxes printed on these letters or return cards could be blacked in by the sender or receiver to designate city, state or postal zone. Then electric-eye sorters would quickly shuffle them into related piles.





9 Umbrella Arrow Hauls in Ducks. There's often a big—and deep—gulf between shooting a duck and bagging it. To retrieve waterfowl that fall beyond wading reach, a hunter would launch this dragline with a bow, overshooting the mark. Pulling in the line would spread umbrella-like folds to haul in his game.

The following patents *have been issued on these inventions: 1. Patent No. 2,783,730 to Seymour Robins, NYC; 2. No. 2,771,-537 to Morris D. Lichtenstein, Chicago; 3. No. 2,782,621 to Gottfried Leuenberger, Schlieren, Switzerland; 4. No. 2,780,882 to Lemuel M. Temple, North Haven, Conn.; 5. No. 2,787,649 to James W. Ballard, Dayton, Ohio and Milton M. Moorhead, Jr., Stamford, Conn.; 6. No. 2,782,068 to Delbert E. Esche, Dearborn, Mich.; 7. No. 2,776,065 to Ferdinand J. Loretitsch, Brooklyn, N. Y.; 8. No. 2,775,405 to Louis Paston, NYC; 9. No. 2,722,075 to Elmer L. Abrassart, Vincennes, Ind.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D. C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

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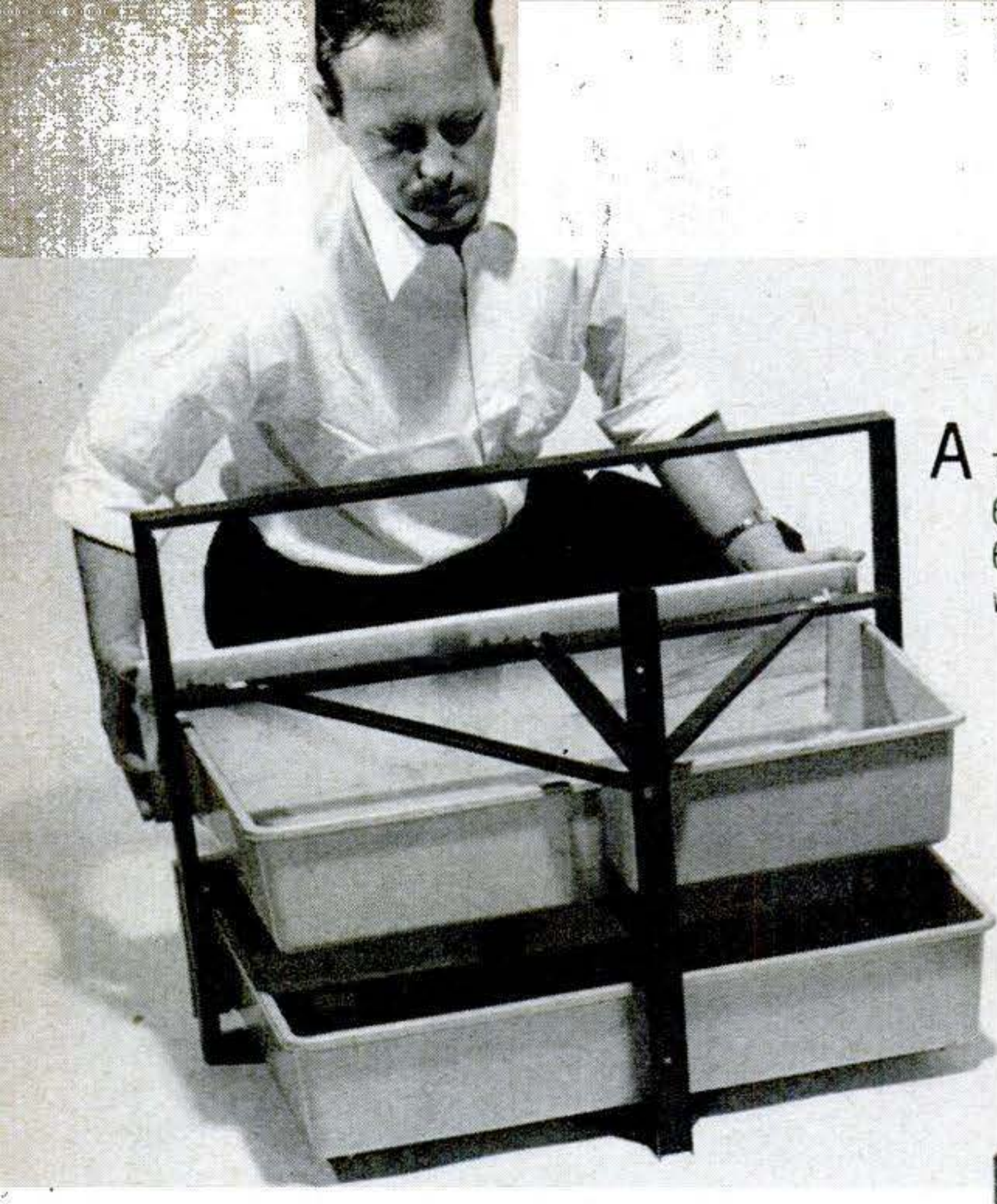
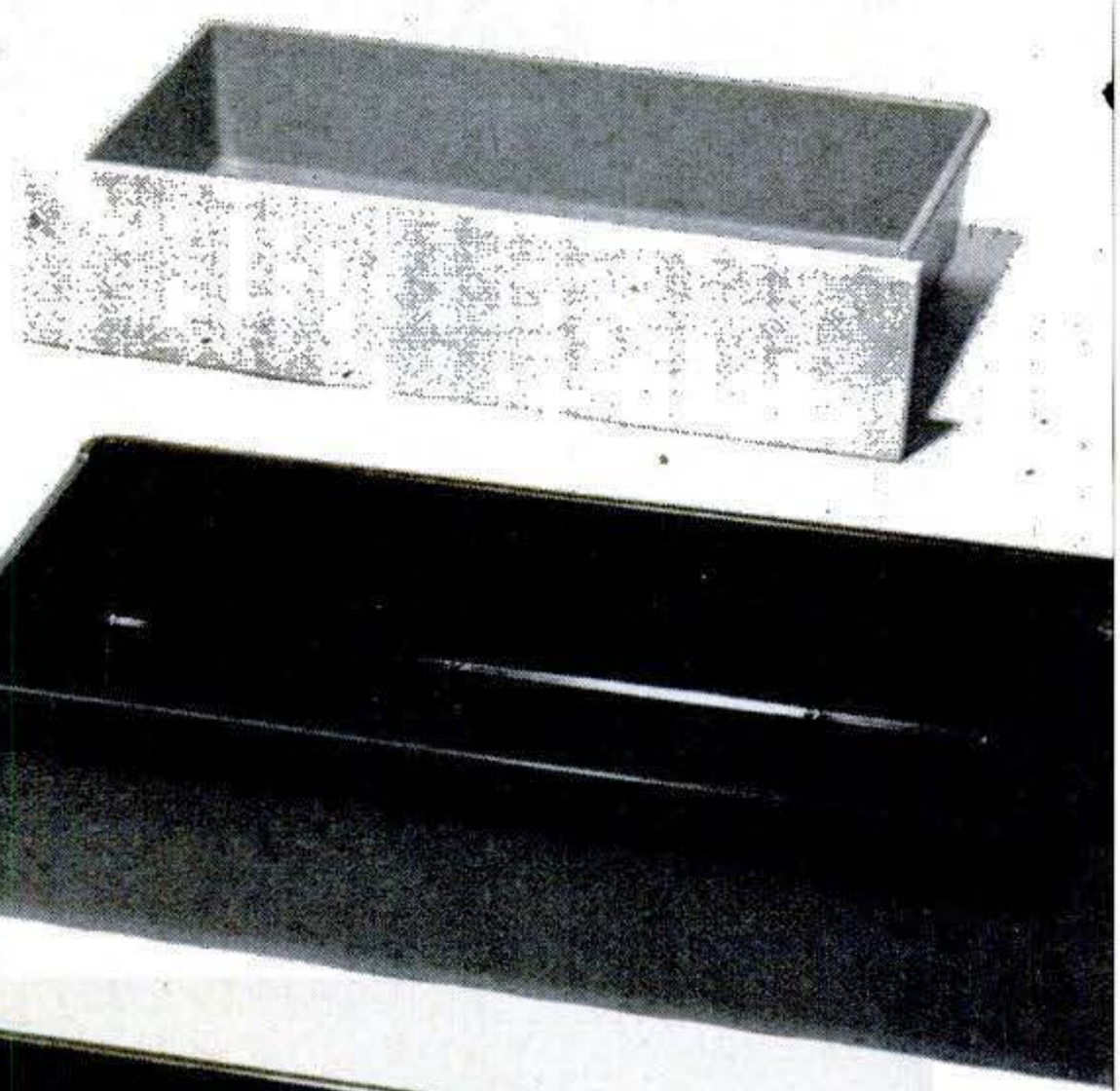
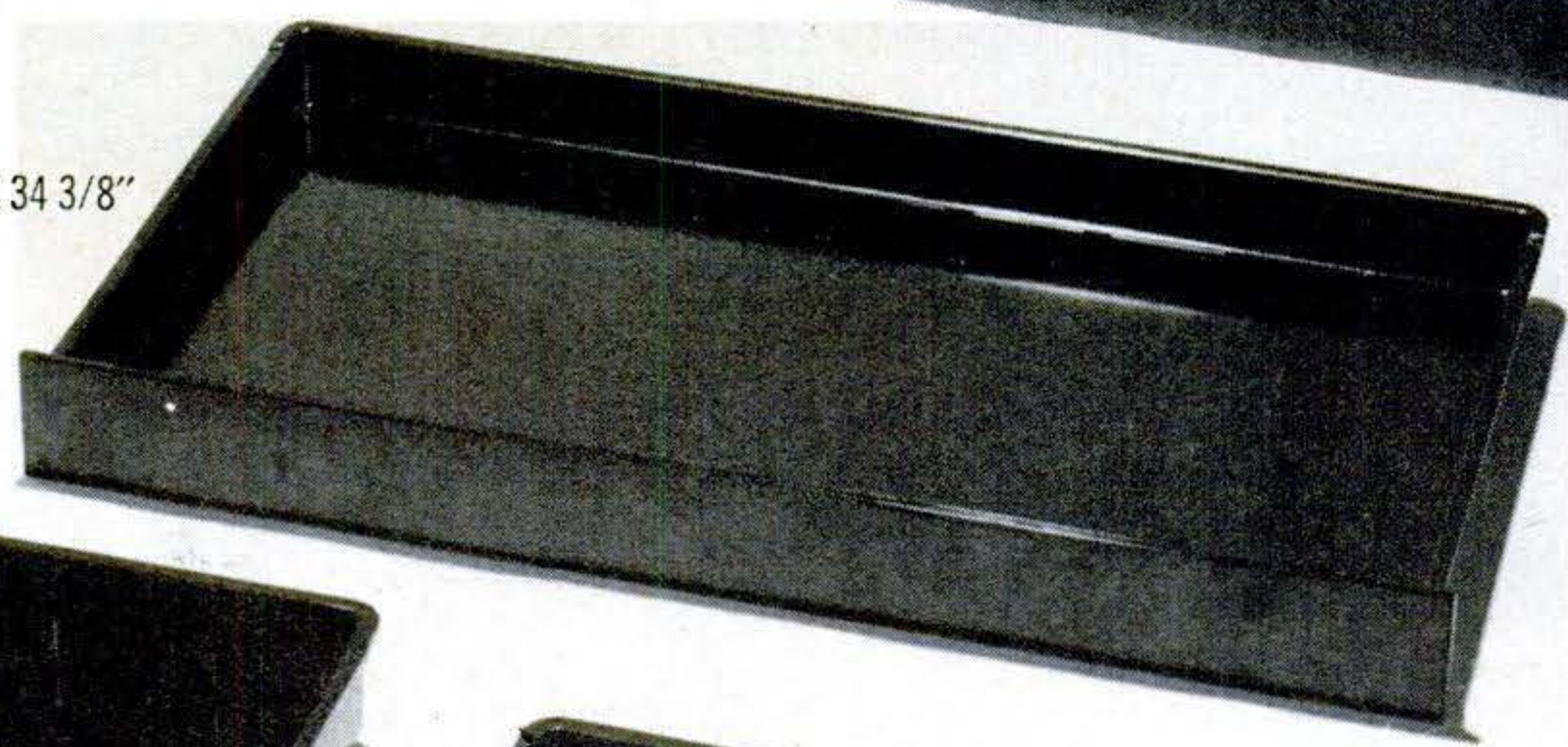


A Three-sided plastic molding, 6 1/8" X 16" X 28 3/8", with 6 7/8" X 30" wood front. Sold with metal frame shown at left



B 7 3/16" X 18 3/16" X 34 3/8"



C 3 9/16" X 18 3/16" X 34 3/8"

D
4 5/16" X 18 3/16" X 17 1/8"

E 4 11/16" X 14 3/4" X 17 1/8" (Also 4 3/4" X 14 1/2" X 16 3/4")

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How You Can Use Molded Drawers

Now here in new sizes, they short-cut many cabinetmaking jobs

By Ralph Treves

WHEREVER an extra drawer is needed around the house—in a kitchen cabinet, desk, pantry, shop or attic—you can install one in less than 10 minutes with just a screwdriver.

Sound too good to be true? Not today! All you do is screw on the rails. The drawers come ready to roll.

Factory-made drawers of molded plastic are practical, good-looking and free of the age-old troubles that beset conventional drawers. They come in a half-dozen sizes, including a big 34⅜″ width suitable for under-the-bed storage of linens and blankets. Additional sizes are in prospect as the drawers come into wider use.

Two types are available. The first consists of a one-piece seamless molding. The other is a three-sided molding with a wood front.

The one-piece drawers, molded of black Bakelite, are now available in five sizes through building-supply dealers or direct from manufacturers (see names and addresses below). All-molded drawers may cost you more than similar sizes built at home of wood or plywood, but ease of installation and trouble-free operation are important compensating factors, especially for the amateur builder.

You can install the one-piece drawers on wood guides just as you might home-

NO TRACKS OR FANCY FITTING are needed to install this plastic drawer. A single center rail built into the cabinet fits in a groove molded in the underside of the drawer bottom.

TO HANG A DRAWER under a shelf, counter or workbench, all you need are two metal tracks screwed to wood cleats. The tracks grip the drawer by lips molded into the upper edges.

◁ *The plastic drawers you now can buy*

- Wood-front plastic drawers: A (top left), sold in units of two, three, four, five and six with a metal frame. Prices range from about $21 for a two-drawer unit to about $54 for a stack of six drawers. Obtained from building-supply dealers or maker: Reiss Mfg. Co., 111 Fourth Ave., New York 3, N. Y.
- Individual drawers: B, priced at about $11.50; C, about $9.50; D, about $6—all of one-piece seamless Bakelite—from dealers or Knoll-Drake Co., 575 Madison Ave., New York 22, N. Y.
- Available only in cartons of four for about $20 from the maker (E): Boonton Molding Co., Boonton, N. J.

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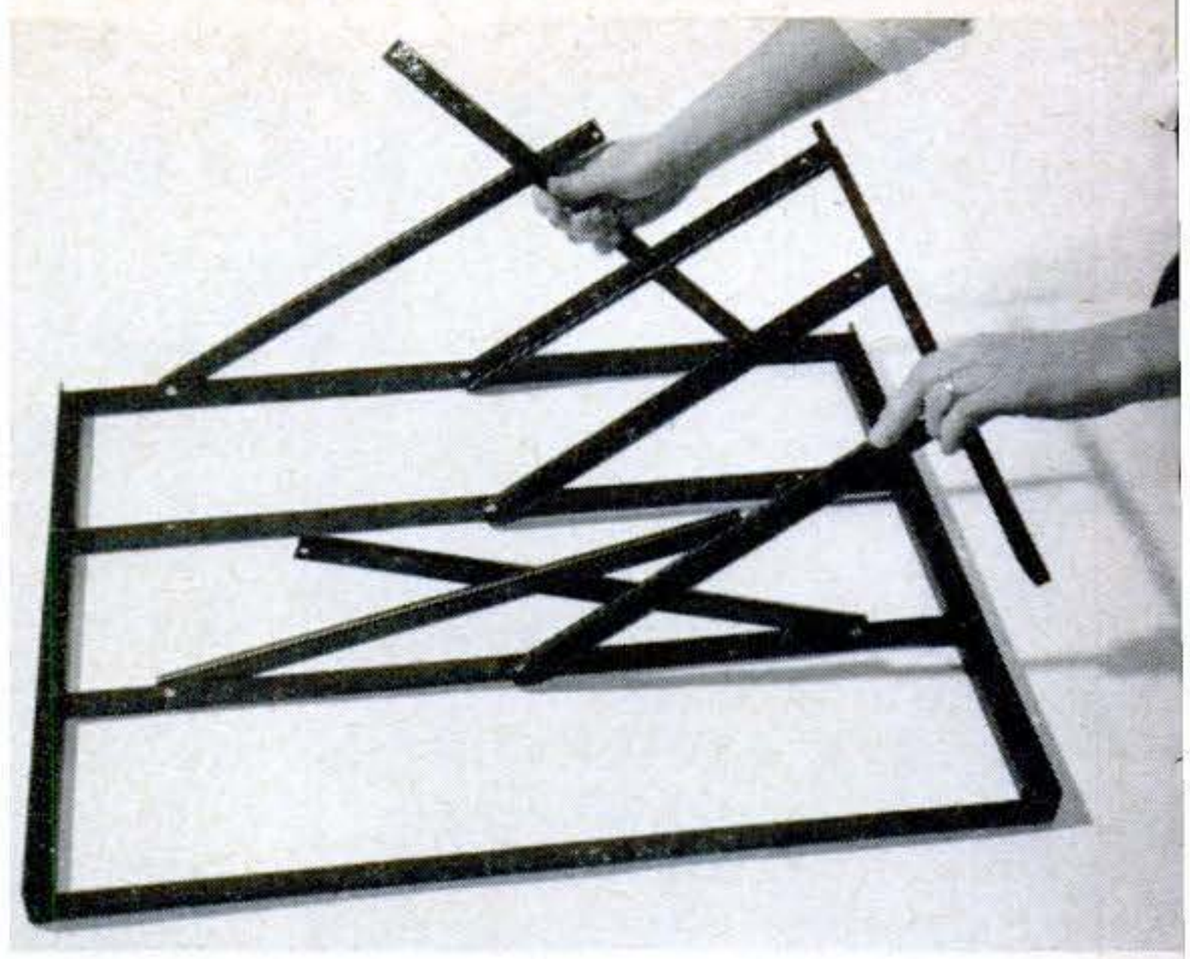
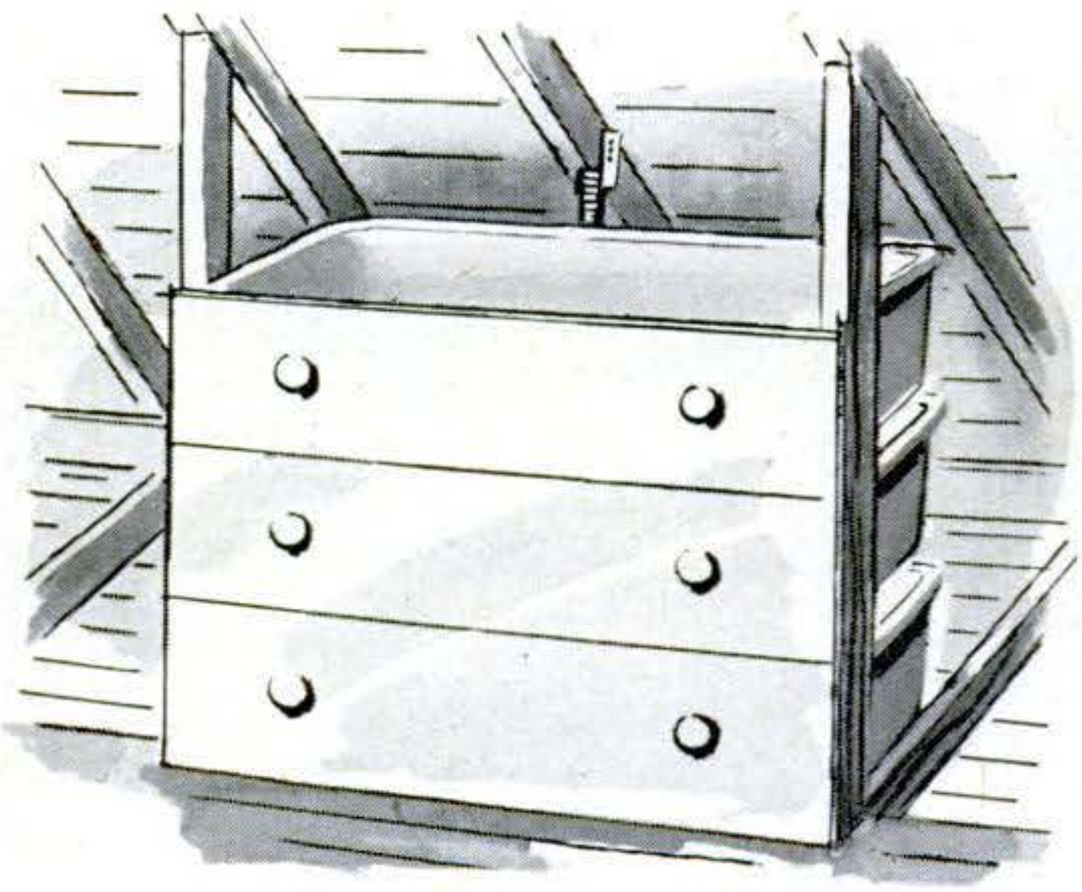
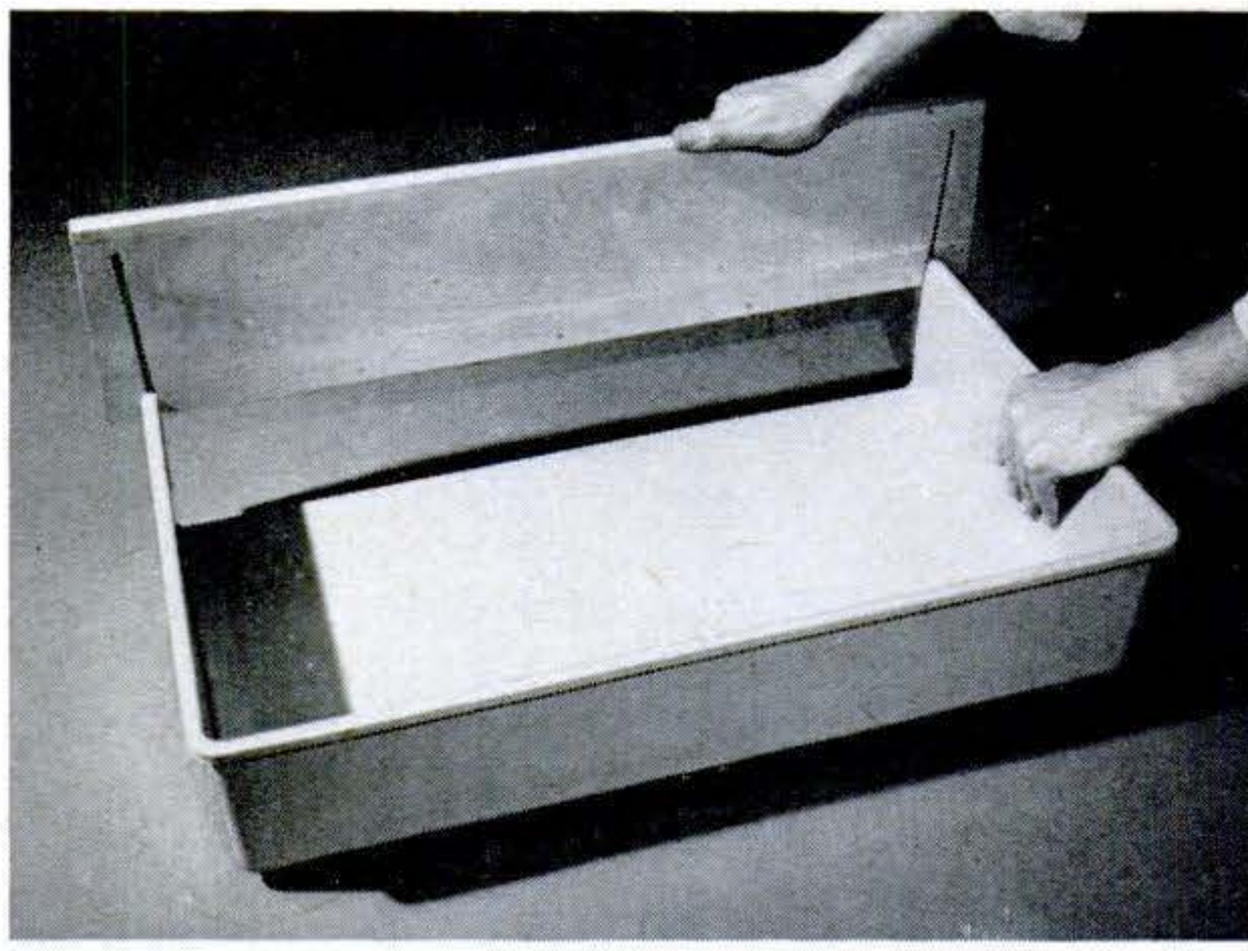
Self-supporting drawer units are ready to use

STACKED DRAWERS, supported by a metal frame, can be used as a form around which to build a simple cabinet, can be built into a wall, or can be left exposed as in a cellar or attic. They come in two- to six-drawer assemblies.



KNOCKDOWN FRAME is tailored to fit the number of drawers ordered. Its welded steel-angle parts fold flat for shipment, swing open for easy setting up in a few minutes.





WOOD DRAWER FRONT is factory-grooved to lock over lugs molded on the front edges of the drawer sides. Grooves are cut at a slight angle to match the tapered sides of the drawers.

made drawers, or you can buy metal hanger-tracks for fast installation and smooth operation.

Flanges along the drawer sides slide smoothly in the tracks. A built-in stop prevents accidentally pulling the drawer all the way out and spilling the contents, yet a slight upward tilt permits easy removal. Deep ridges in the bottom add strength and also serve as guides to run on wood cabinet rails when installed like conventional drawers.

Some plastic drawers have inside ridges, and dividers can be added to partition the drawers for neat storage of silverware, jewelry or small items. The fronts can be painted or surfaced with wood veneer or a plastic laminate to match their surroundings.

Wood-faced plastic drawers are available in just one size. You can't buy the drawers alone; they come with a supporting metal frame made to hold two, three, four, five or six drawers. The frame height varies from 15¾″ for the two-drawer unit to 45¾″ for six drawers.

Frames come knocked down for compact shipping, but can be assembled in a few minutes with a couple of bolts. The wood drawer fronts have factory-cut grooves that lock on the front edges of the three-sided Styrene moldings.

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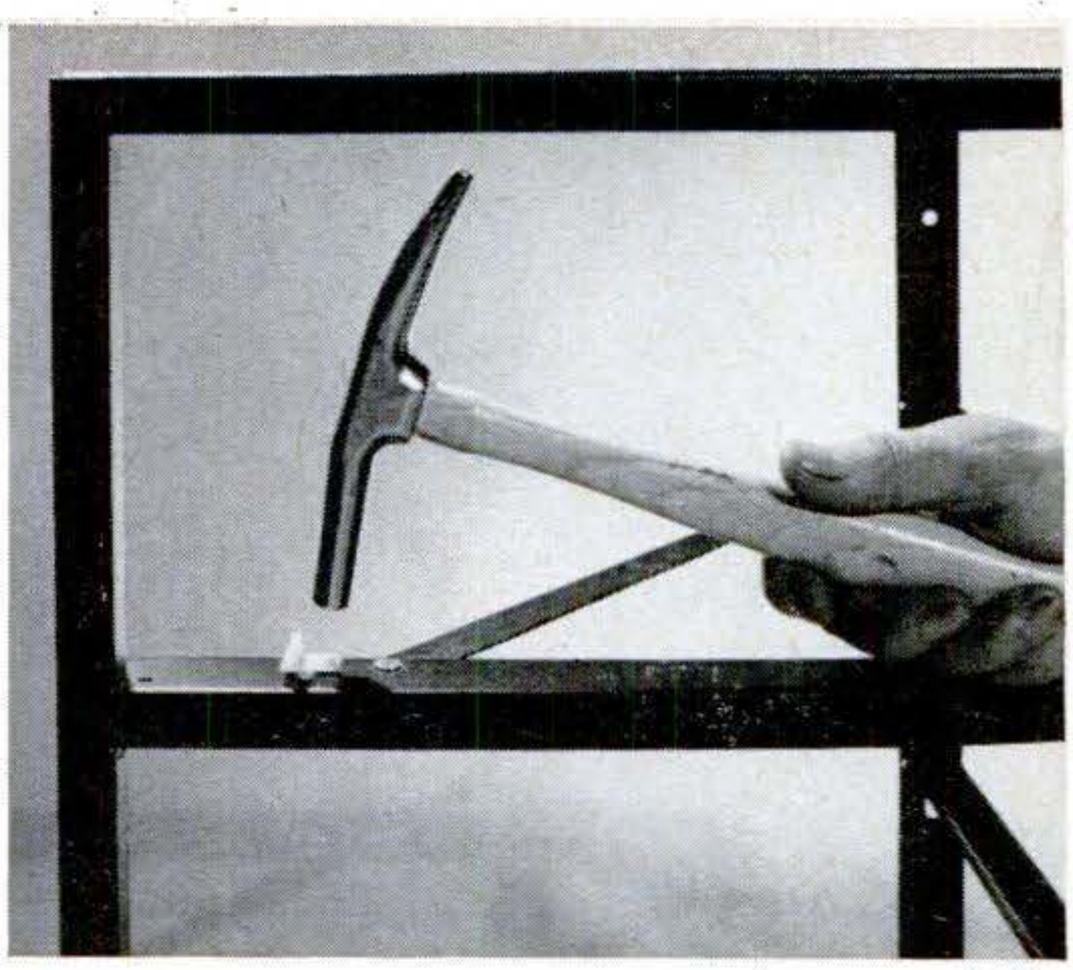
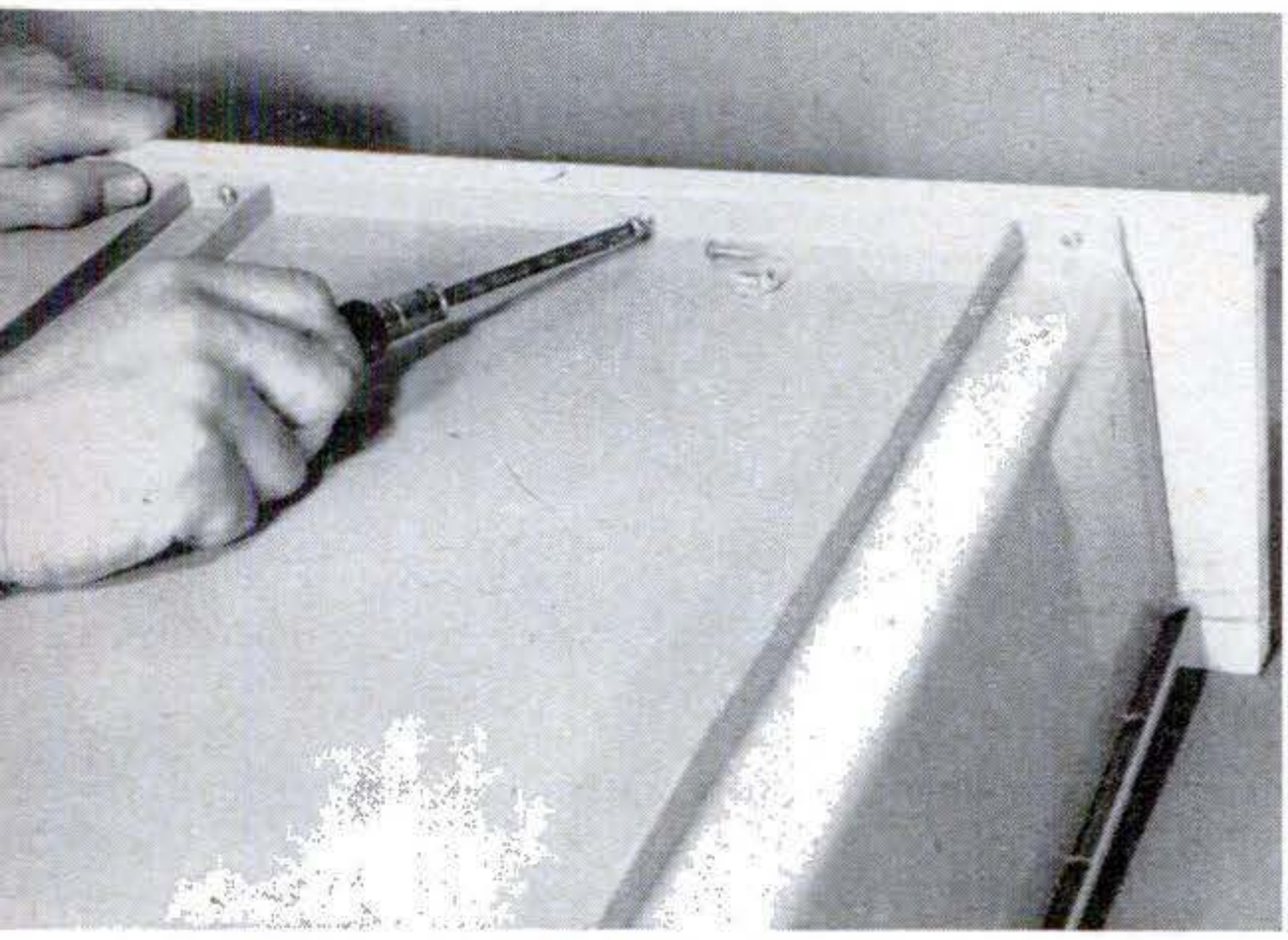
ONLY TWO BOLTS are used to lock the skeleton drawer frame together. Steel center rails fit grooves molded into the drawer bottoms. Frame is braced against twisting and warping.



SMOOTH DRAWER OPERATION is assured by nylon bearings that are driven into predrilled holes in the metal frame. On the bearings, drawers move silently and with little effort.



SCREWS DRIVEN THROUGH LIP on the bottom edge of the drawer secure the wood front after it is slid down over the lugs on the sides. The wood front can be finished natural or painted.

BUILDING A CABINET around the metal drawer frame requires only facings of veneered plywood. Plywood is attached with screws from inside through predrilled holes in the frame.

The self-supporting, multiple-drawer units can be installed as built-ins between the studs in walls or under attic eaves or stairs. The frame can also be installed in existing cabinets or cupboards by adding wood trim to make up any difference in dimension between frame and cabinet. Or you can use one of the units as the base framework and build a cabinet around it.

Installing them is simple. You use molded drawers pretty much as you would ordinary wood drawers. The big difference is that you build a cabinet to fit a group of drawers instead of fitting individual drawers to a cabinet.

The easiest application of one-piece drawers is under a shelf wherever there is sufficient space. Attach the metal tracks to 1″-square cleats and screw the cleats, a drawer's width apart, to the underside of the shelf.

In an existing cabinet, either type of drawer can be used, depending on how it fits the existing dimensions. If the drawers are not the exact width, the cabinet opening must be reduced by adding wood at each side and at top and bottom. Then you screw the tracks to wood shims to bring them into position for the drawers.

If the wood-faced drawers are used, the

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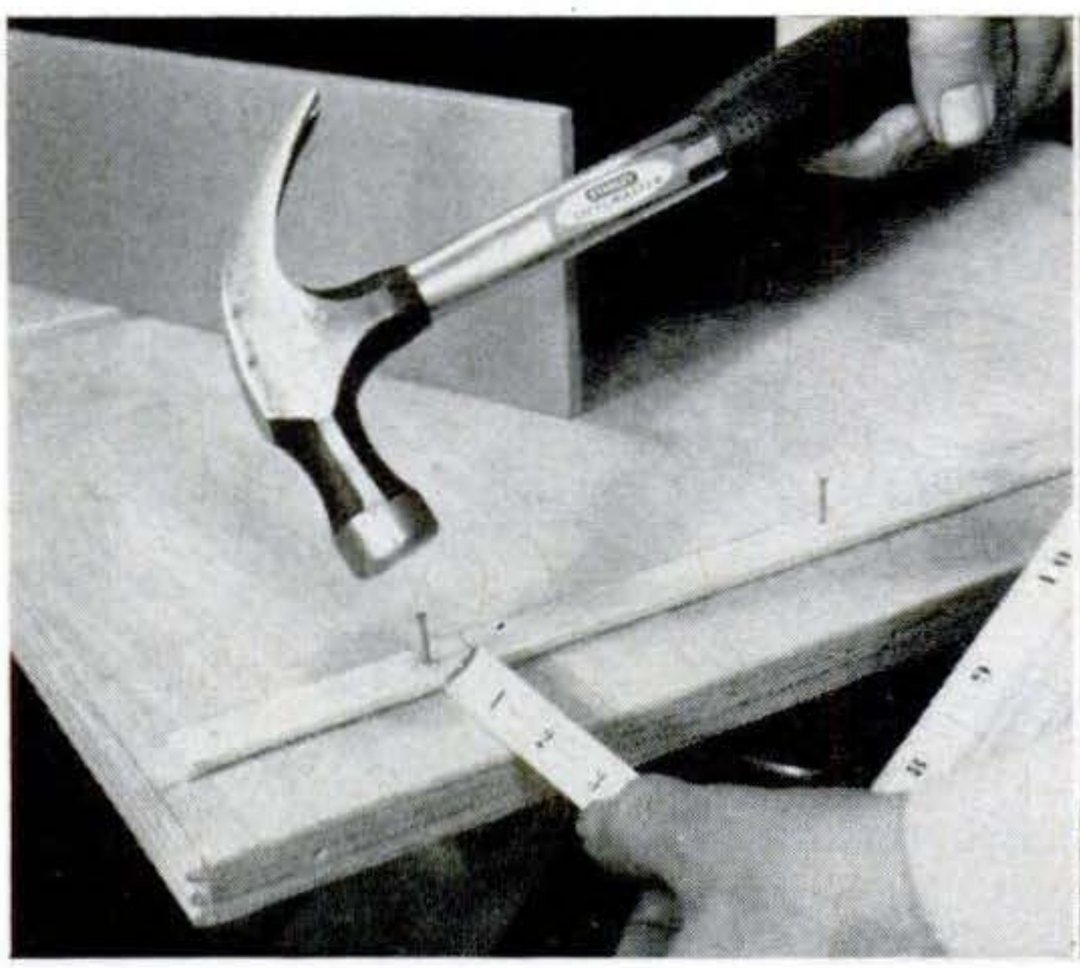
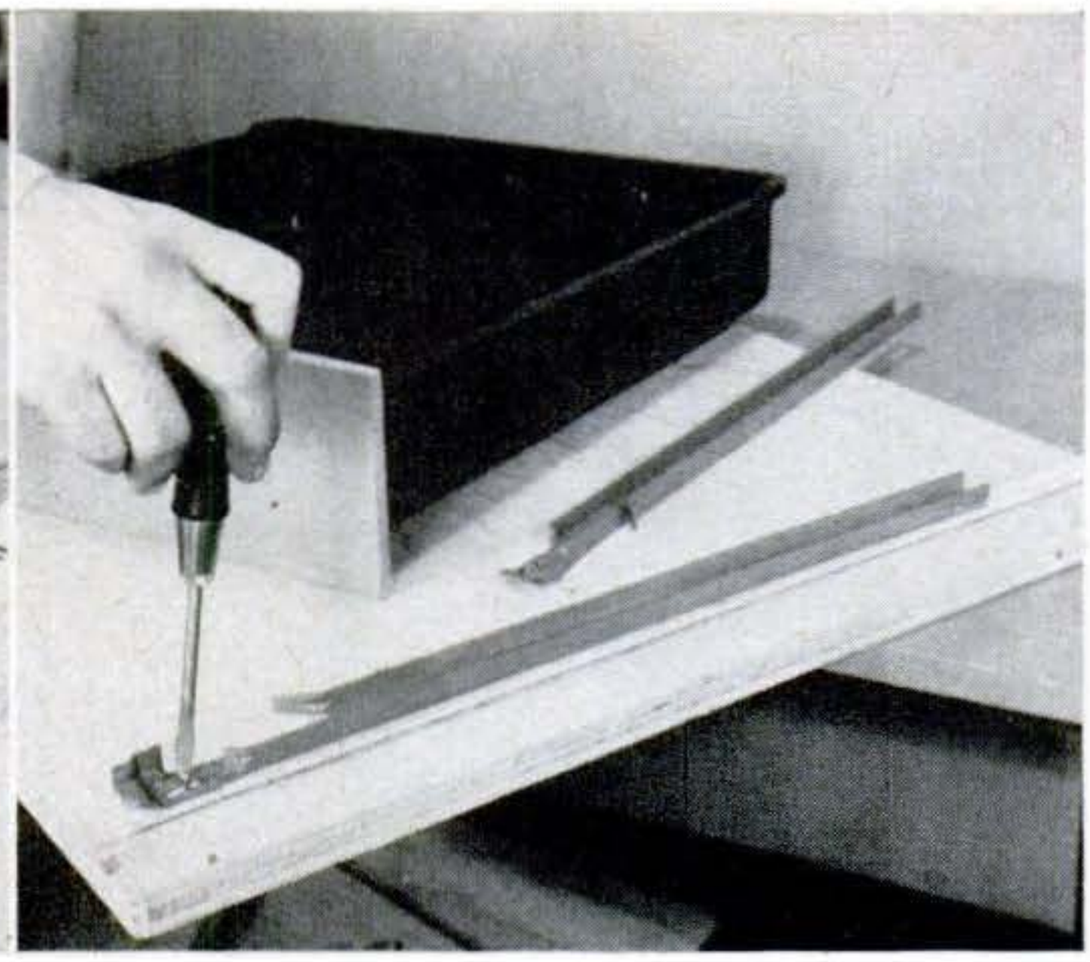
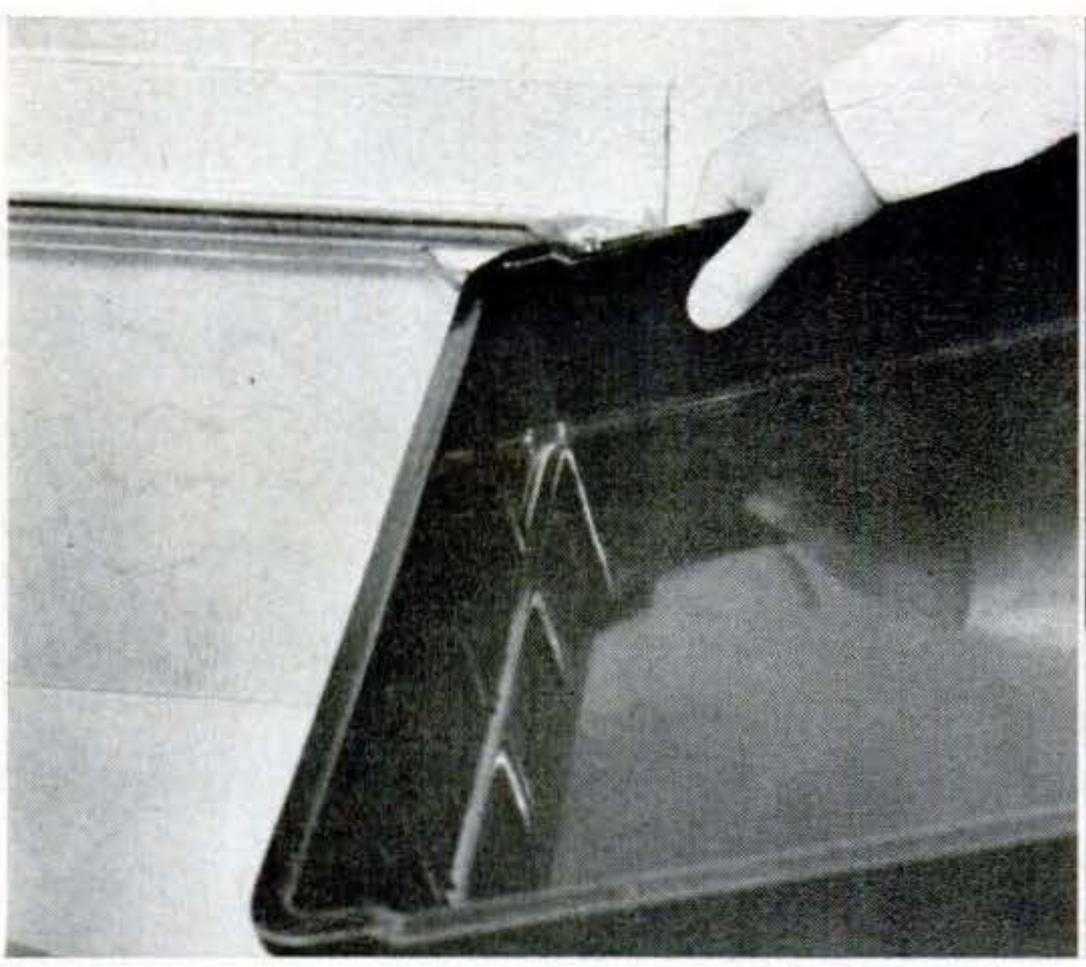
How to install one-piece drawers on tracks



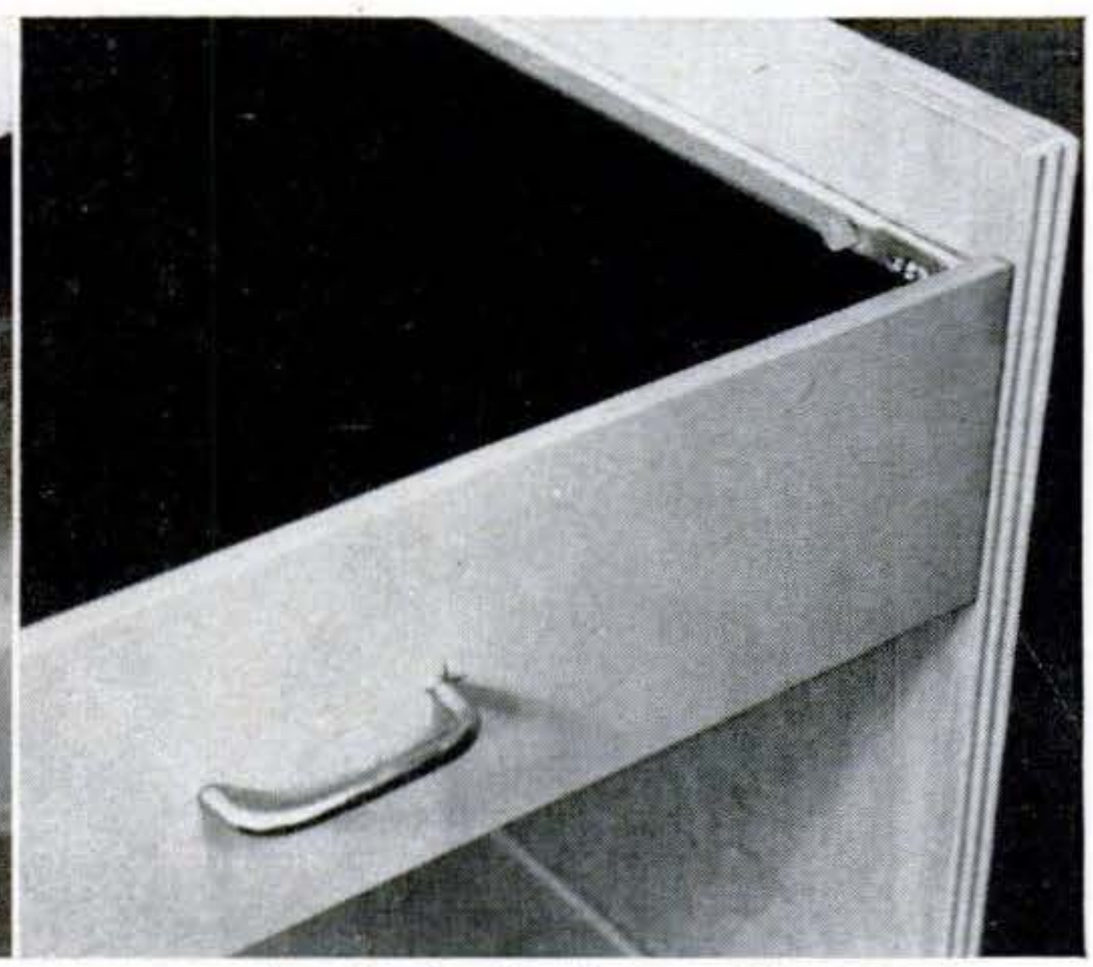
FILLER STRIPS of thin wood are first nailed to sides of cabinet to space the tracks out if you want drawers to fit flush with the front. Measure carefully so the tracks are parallel.



METAL HANGER TRACKS are then screwed in place over filler strips. Screw holes in the track are slotted to permit adjustment to align drawers with each other and with sides of the cabinet.



FLANGES ON SIDES OF DRAWERS slide in tracks. Drawers must be tilted upward when being installed. Tabs on front end of the tracks keep the drawer from being pulled out too far.



NEAT FIT is obtained after making fine screw adjustments to bring drawer flush with cabinet when closed. Drawer fronts can be made to overlap cabinet sides by omitting filler strips.

metal frame must be installed in the cabinet and wood added to reduce the opening to the frame size. Either type of drawer can be used if the cabinet's center guide rails can be adapted to fit the ridges molded in the drawer's bottom.

In a wall opening, the wood-faced drawers have an advantage. The metal frame is 30⅛″ wide to fit inside standard 16″-center wall studding (you remove one center stud) with ¼″ allowance for fitting.

Once installed and screwed to the wall studs, the frame provides full support for the drawers, and the wall paneling is fitted around them. Adjust the fore-and-aft position of the frame so the drawers are flush with the wall surface when closed.

To build a new cabinet, attach the sides, top and back to the metal drawer frame. The result will be a solid, wobble-free unit in which the drawers are held in correct alignment. If the one-piece drawers are used, tailor the cabinet's dimensions to fit the drawers with enough clearance on each side to allow for the metal tracks. END

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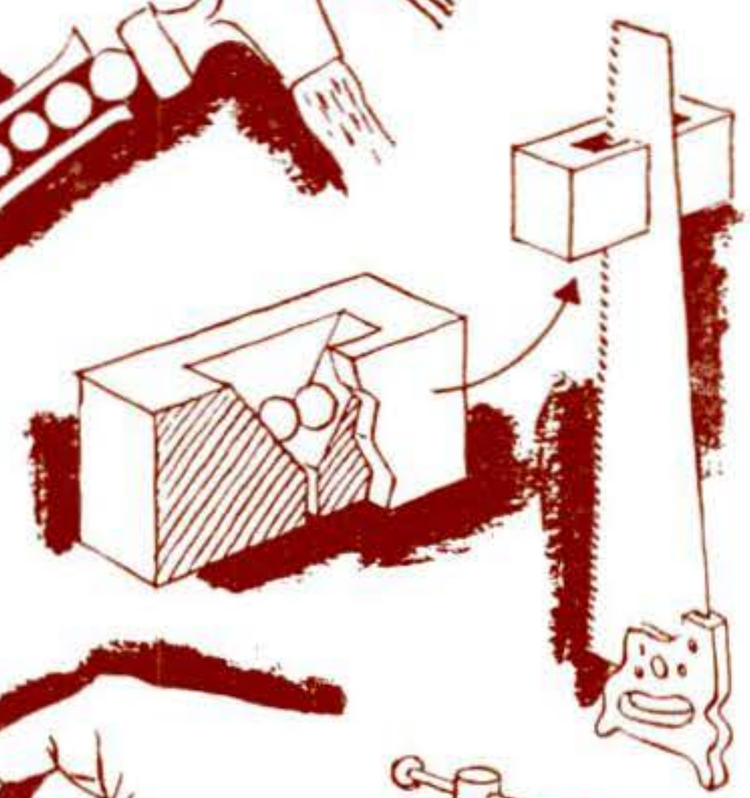
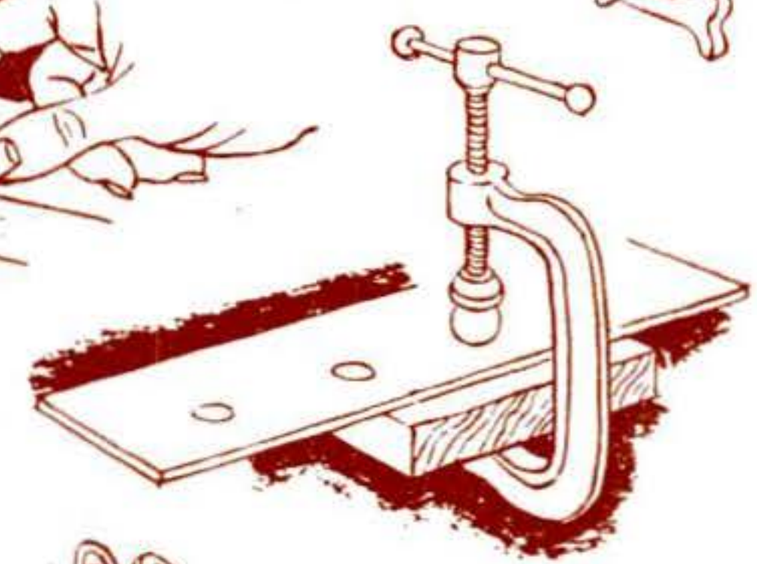
10 Uses for Steel Balls

STRAIGHTEN KINKS in metal tubing by ramming in progressively larger steel balls until the final one is just the diameter of the tubing. Drive through the final ball by tapping it with a steel rod.



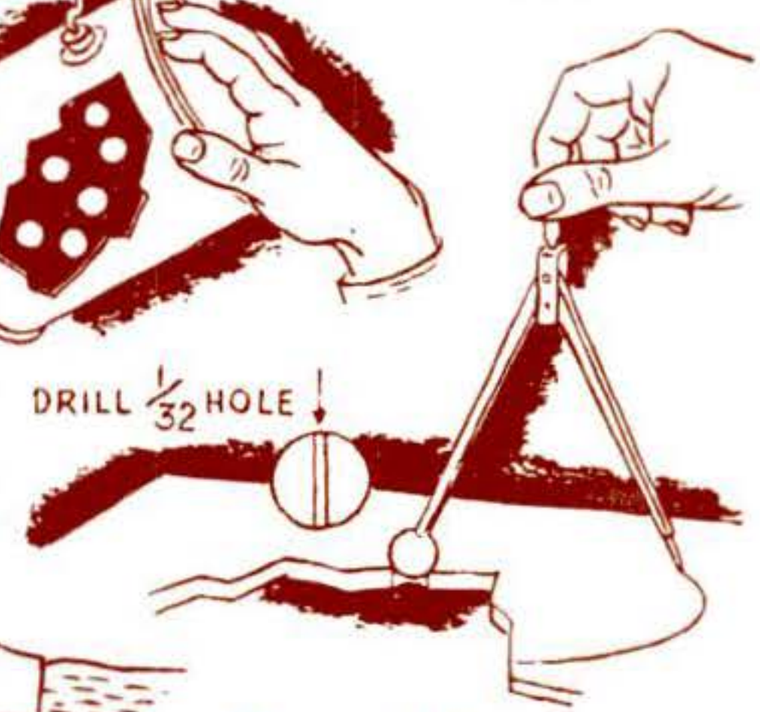
A RACK FOR A HANDSAW can be made by sawing part way through a two-by-four and then chiseling out a V-shaped slot just wide enough to place two balls at the top of the kerf. When the blade is pressed into the slot the balls will grip it.

DETECT SLOPING FLOORS, in a house you may be planning to buy, by using a steel ball as the sleuth. If the ball rolls, the floor is uneven.



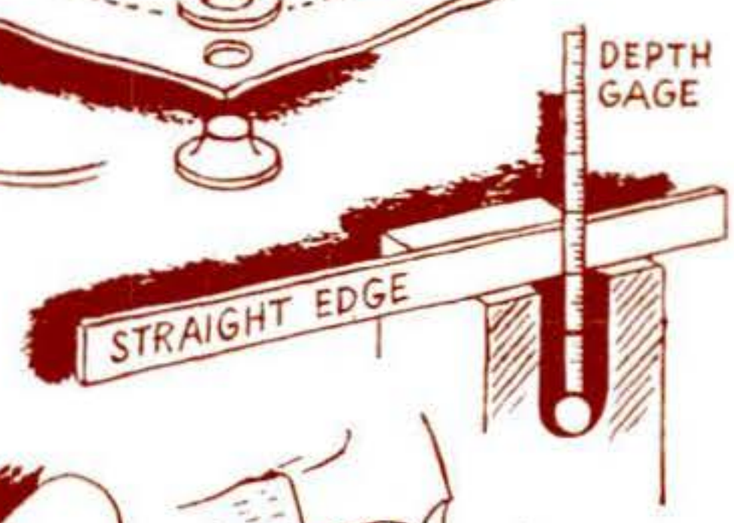
COUNTERSINK LIGHT METAL for screwheads by forcing a steel ball into the metal with a C clamp. Back the metal with a wood block, aligning a drilled hole in the wood with the ball.

MIX PAINT quickly and thoroughly by shaking the can with some steel balls inside. Leave the balls in the can until it's empty, then re-use them.

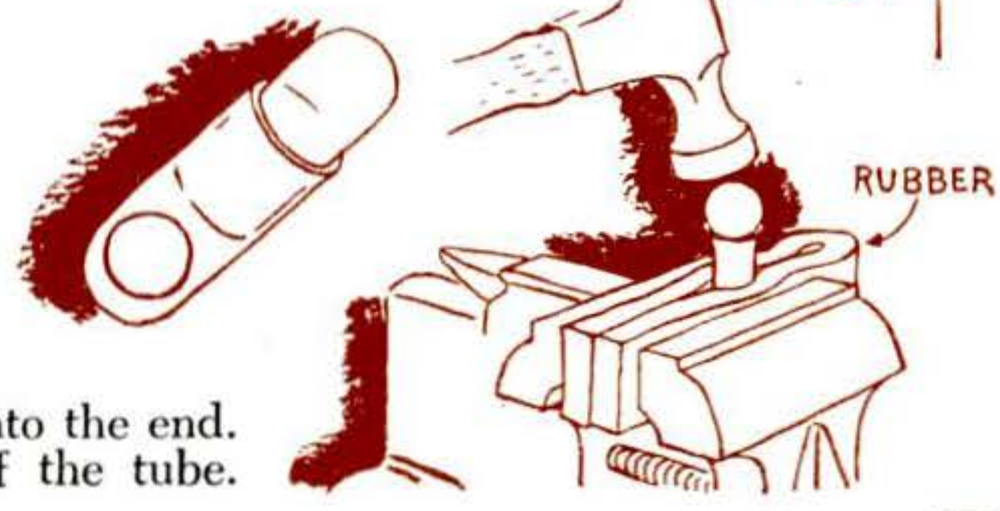


ACCURATE CIRCLES can be drawn from the center of a hole by anchoring one leg of a pair of dividers in a steel ball drilled to receive a leg. Anneal the ball first by heating to a glowing red and letting it cool off gradually. You can then drill the hole in a lathe or drill press.

FASTEN A GROMMET in canvas by starting it with a steel ball. Flatten the grommet the rest of the way with a few direct hammer blows.



MEASURING HOLE DEPTH is often tricky because the drill leaves a sloping bottom. You can get around this by measuring to the top of a steel ball and adding the ball's diameter.



KIDS ENJOY PLAYING with a medicine capsule that flips end over end down a sloping surface. A steel ball inside animates the capsule.

FLARE METAL TUBING by tapping a steel ball into the end. Use a ball that is slightly larger than the bore of the tube.

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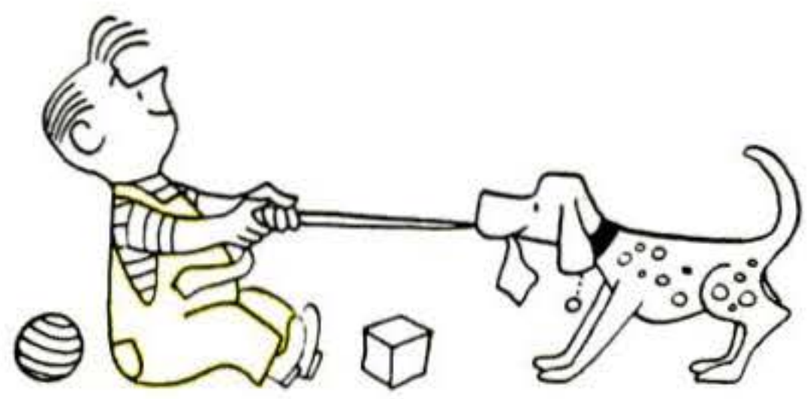
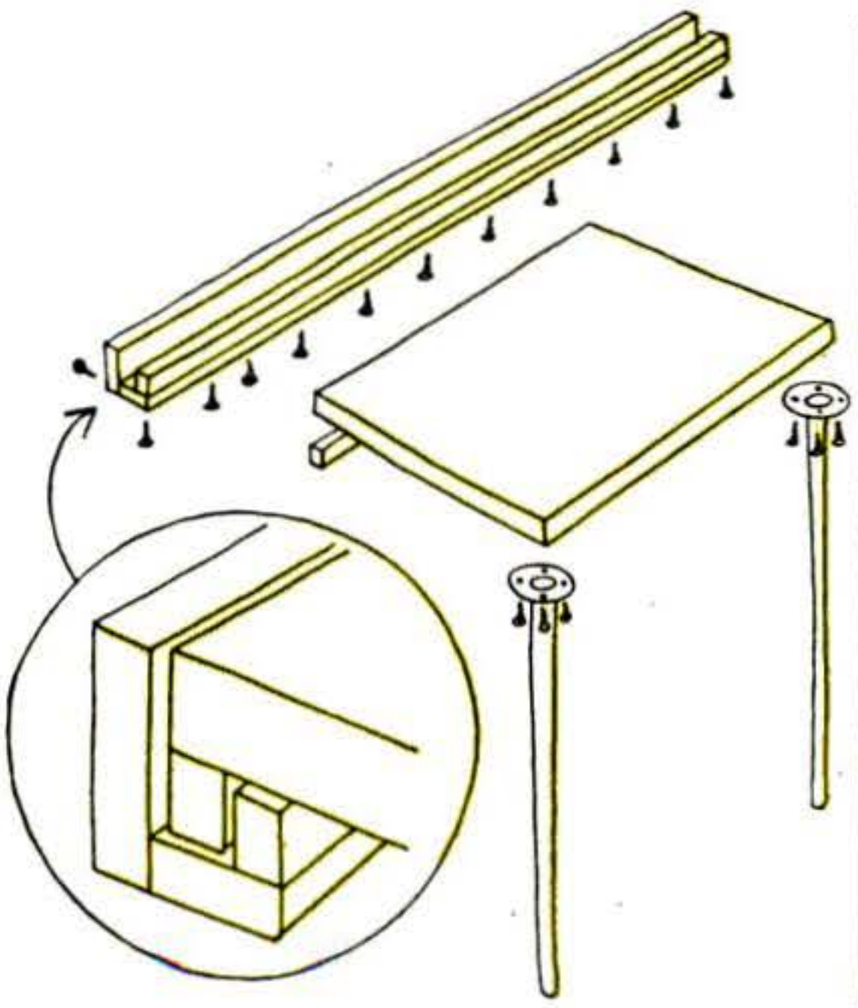
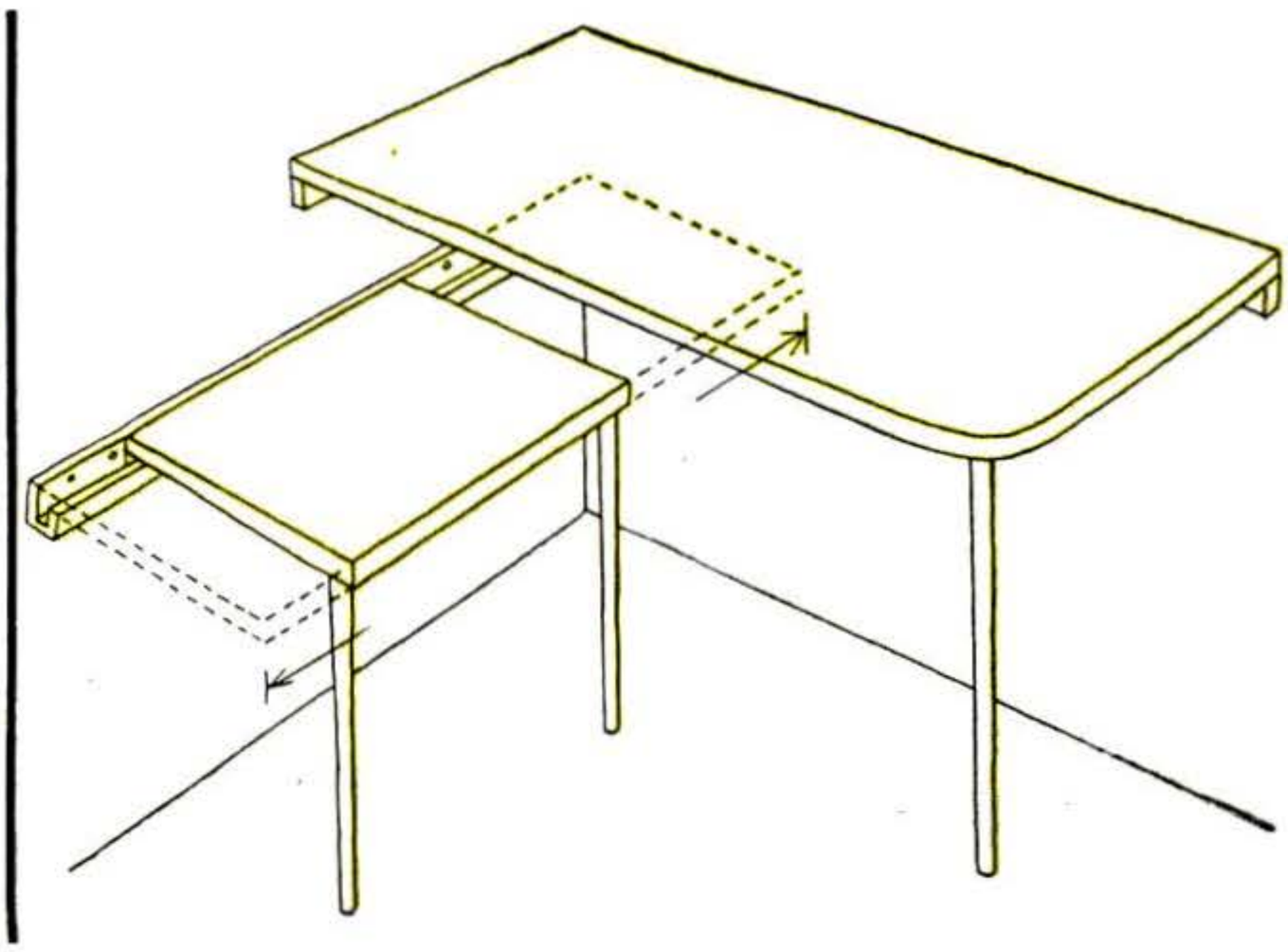
Wordless Workshop

By Roy Doty
and Rosa Lee Beeland







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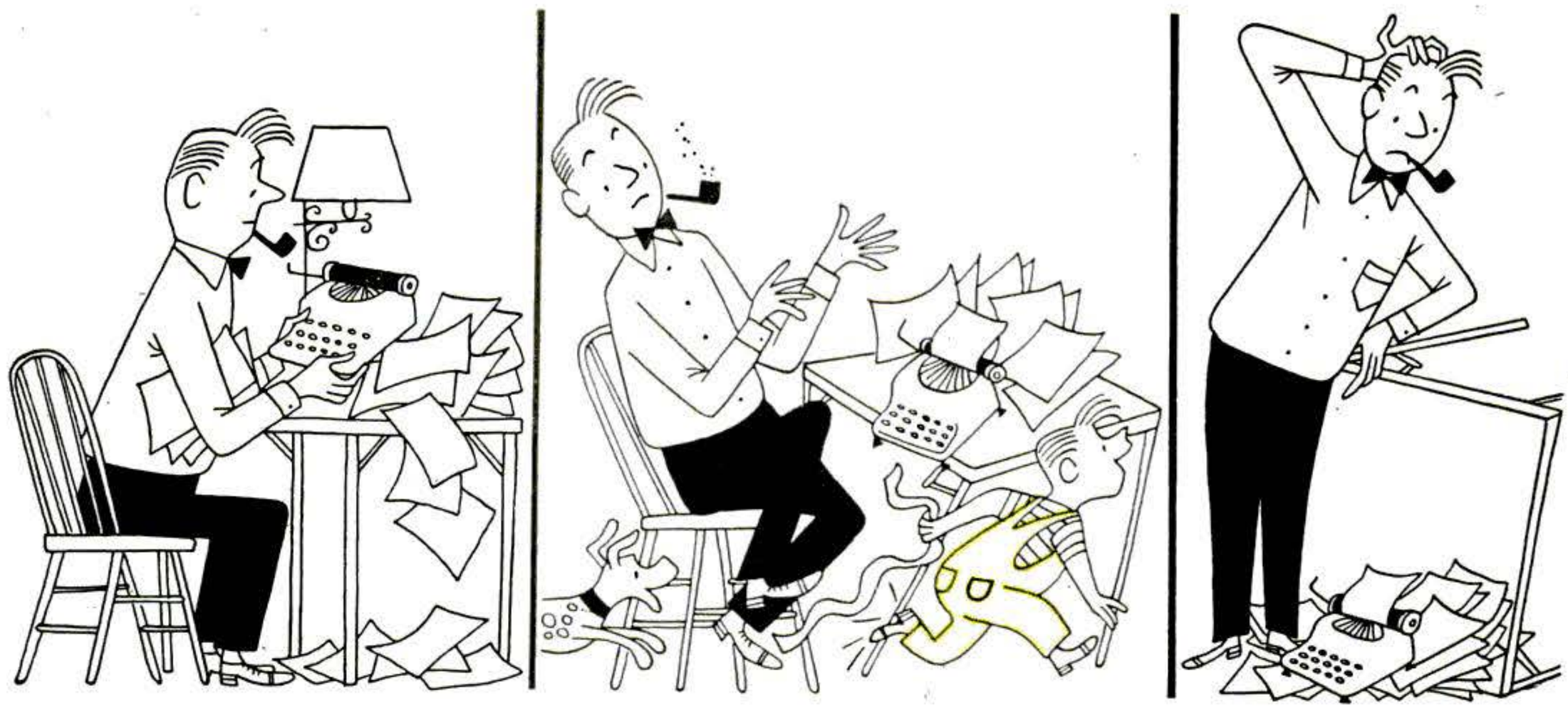

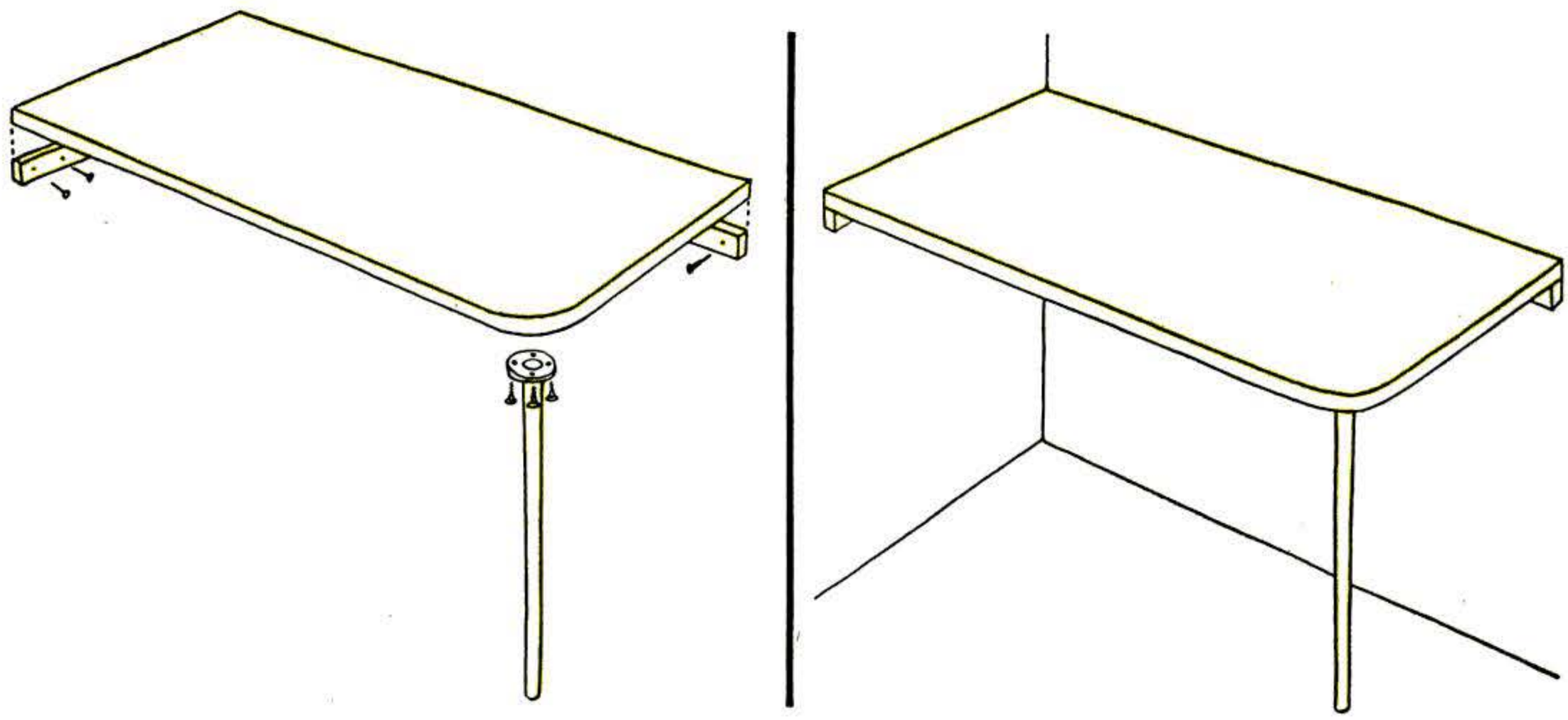

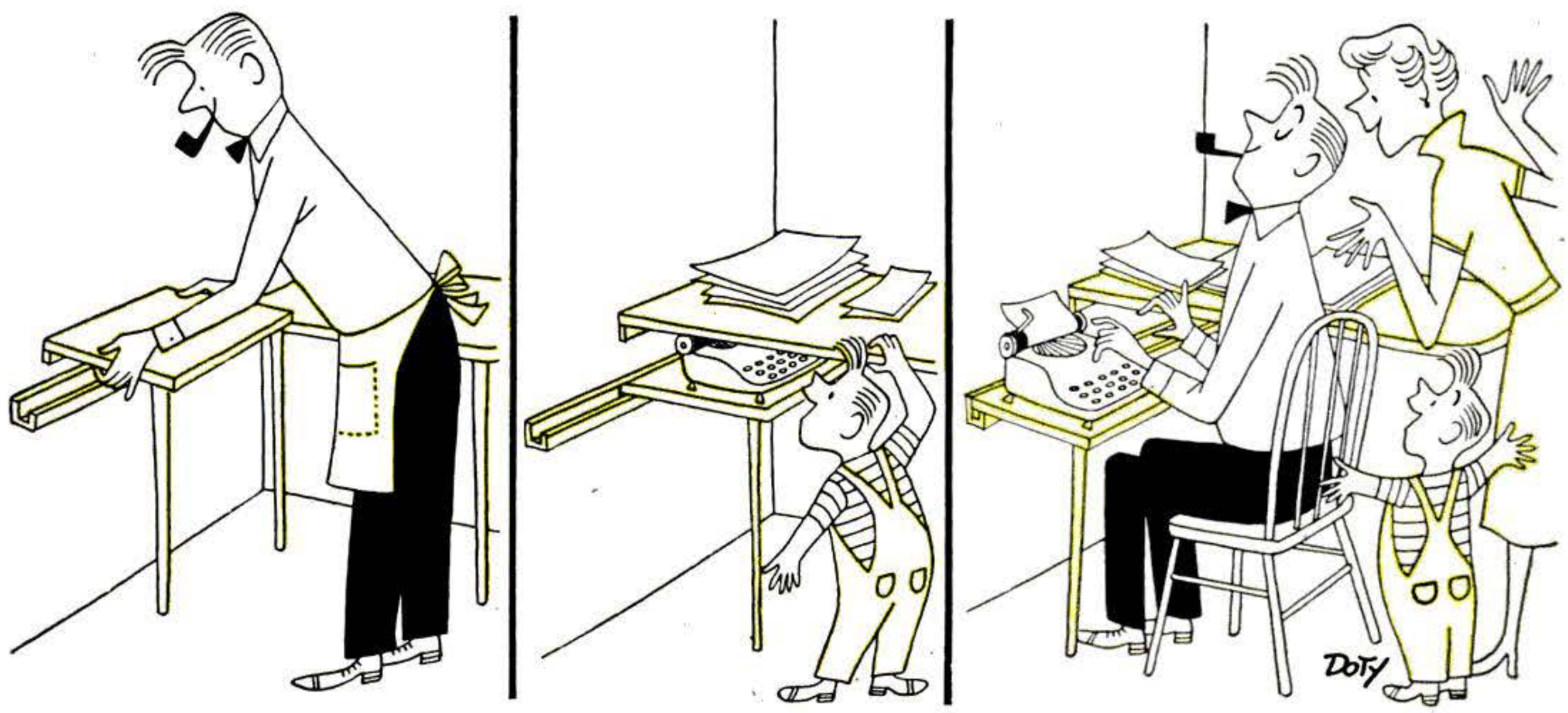

Next Month: A baby stroller gets runners for easy use in snow

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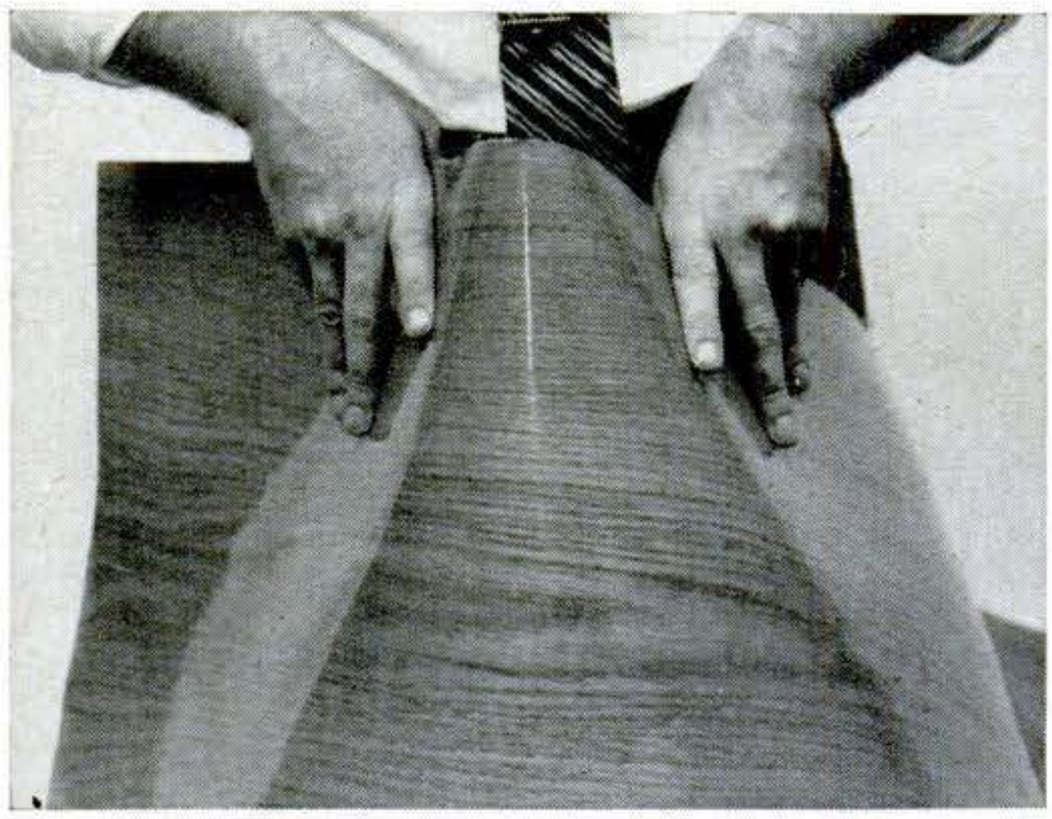
New for the Handyman

1. Rubber-in-a-tube requires no patch and no vulcanizing tools to make a repair. You simply squeeze it over a cut in a tire, or a tear in a raincoat, and let it dry for a half hour. As chemical action vulcanizes it without heat, it forms a tough and resilient patch, black in color.

The putty-like rubber makes a coating that is rustproof and non-inflammable as well as waterproof. It will mend plastic and canvas, seal holes in vacuum cleaner bags and hoses, fill in damaged insulation on electric wires or serve as a calking compound.



2. Prefinished wood by the sheet makes covering walls with genuine wood as easy as hanging wallpaper. The 3′-by-6′ flexible sheets are made by backing fine veneers of birch, walnut, oak and other woods with felt or canvas. You choose the backing to suit your particular application. A clear vinyl coating makes the wood stain and scuff resistant.

Not only walls, but cabinets, table and counter tops, floors and ceilings can be covered with the material. You can cut it with a knife or sharp scissors and bend it smoothly around curves. Glue, contact cement or mastic will bond it to stone, wood, metal and many other surfaces. No special clamps are needed.

3. Tape sticky on both sides does many little gluing jobs without mess. You just stick it on the back of whatever is to be fastened down and then press the object in place. It's fine for sealing envelopes or mending torn wallpaper, and it will mount photos invisibly. Try it, too, for holding screws on a screwdriver, attaching felt pads to ornaments, or securing a loose innersole in a shoe.

Although both sides of the new Scotch Tape are adhesive-coated, the two adhesives are incompatible and won't stick to each other. Yet they'll stick to almost anything else. The adhesive on the upper side seems less tacky to the touch, but both have the same holding power.

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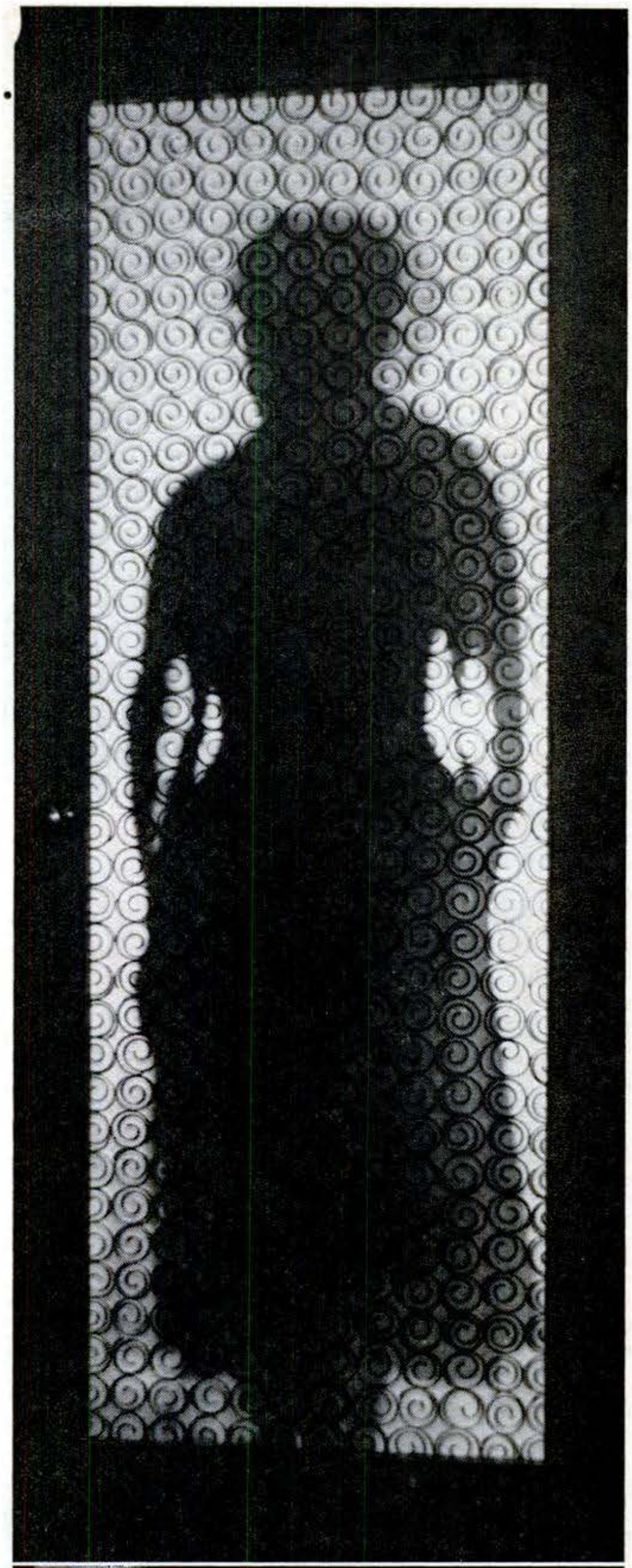
4. Translucent door panel has curls of cedar wood sandwiched between two sheets of plastic. Strengthened with glass fibers, the plastic won't shatter, and the dead air in the space between the double walls provides good insulation.

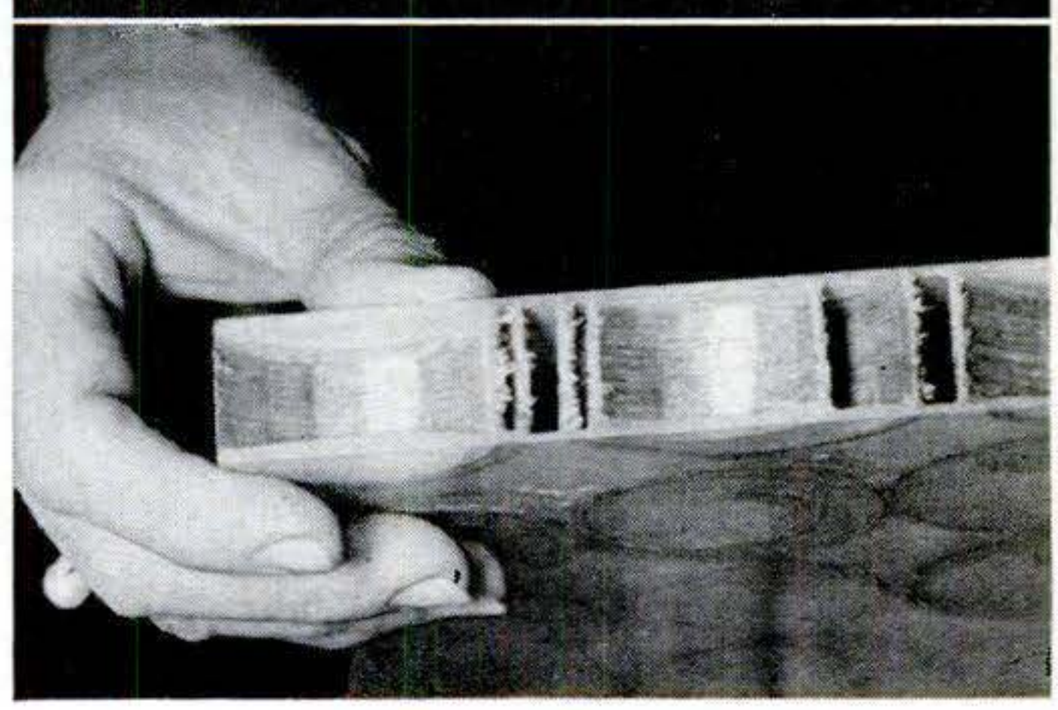
You can buy the panels in stock sizes 3′ to 4′ wide, 8′ to 10′ long, and cut them to fit the opening after removing the glass or wood paneling in a door. Or the manufacturer will cut the material to your specifications. Thicknesses range from ⅜″ to 1½″ to suit various doors. The panel is set into the opening like glass and held in place with molding.

Both interior and exterior doors can be fitted with the decorative plastic, and there is a choice of 22 colors. You can also install it in a window to block out a drab view, or use it to make light-admitting partitions and room dividers.

5. To save your hands when you tackle rugged jobs like working with rough stone, mixing up lime or wrestling with big boulders, you need a work glove that won't slow you down or impede your grip. This one, made of tough cotton twill coated with black neoprene, is said to be highly flexible and more slip-proof than bare hands. And its skin-protecting rubber coat is resistant to acids, solvents, oils, caustics and other chemicals. Knitted wrists hold the gloves in place and a cotton lining absorbs perspiration.

More information *about these products can be obtained from: 1. Woodhill Chem. Mfg. Co., 1391 E. 33rd St., Cleveland 14; 2. Great Eastern Lumber Co., Box 223, Glens Falls, N. Y.; 3. Minnesota Mining & Mfg. Co., St. Paul; 4. Russell Reinforced Plastics Corp., 521 W. Hoffman Ave., Lindenhurst, N. Y.; 5. Pioneer Rubber Co., 196 Tiffin Rd., Willard, Ohio.*





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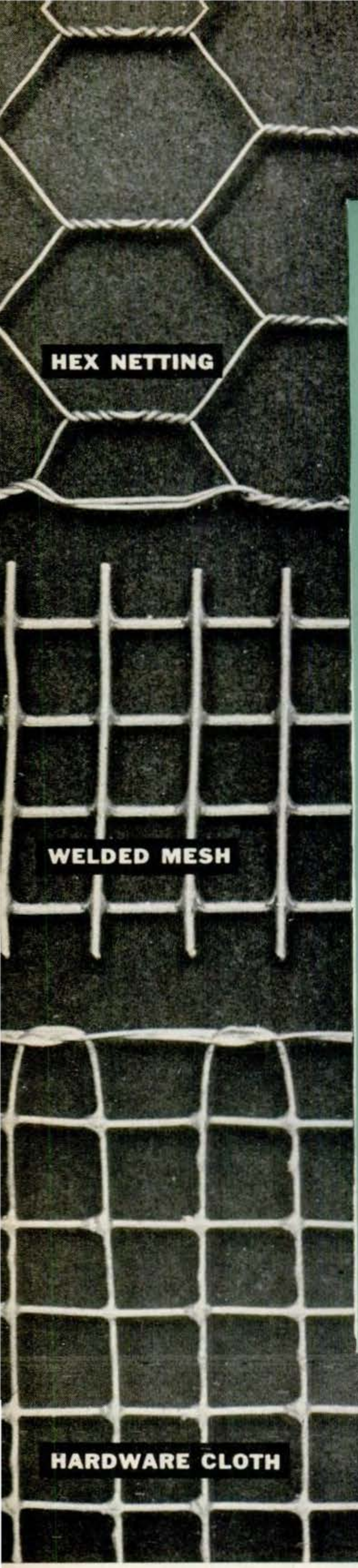


Money-saving pointers and trouble-saving tips:

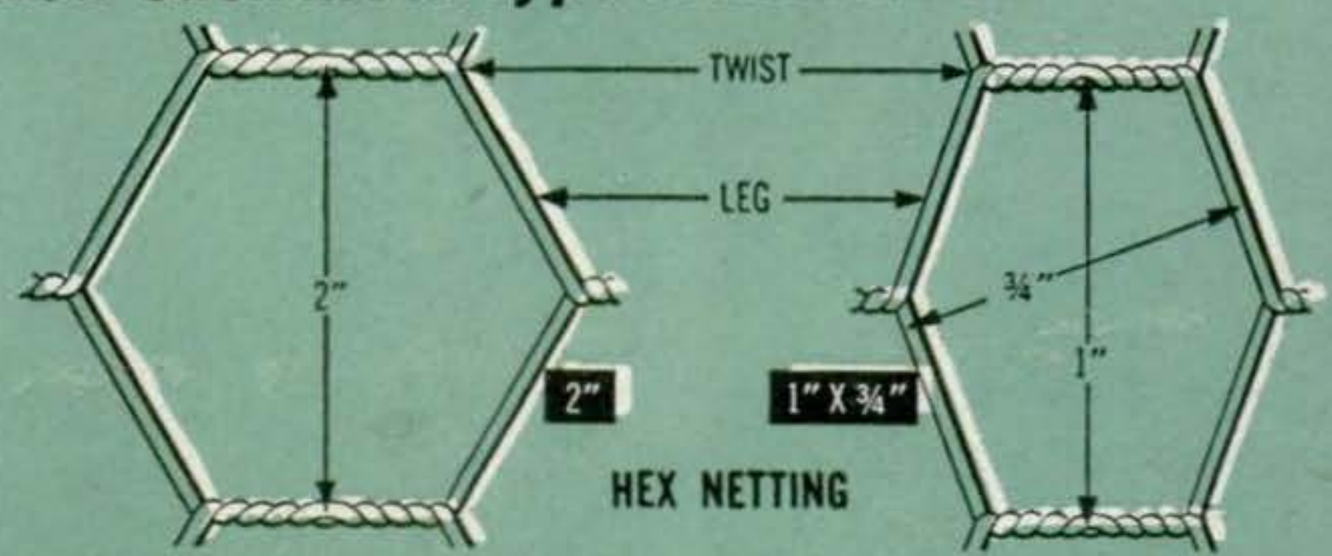
Practical Guide

EVERY householder ought to know the relative merits of three kinds of wire mesh found at most hardware stores—hexagonal netting (or chicken wire), welded mesh and hardware cloth.

You can use them for an endless range of jobs. On the smallest budget, too; prices start at 2½ cents a square foot. For some jobs, any kind of mesh is suitable. For others you'll need a specific type, grade, mesh and gauge.

Choosing mesh and wire size. The bigger the mesh and the lighter the wire, the less the cost. For economy, use the biggest-mesh, lightest-gauge material that will do the job right. Choose wire size on the basis of the abuse the material must take and on mesh size. In general, favor heavy wire for large mesh, light wire for small mesh where you have a choice. Use heavy-gauge wire, too, where excessive corrosion may occur—in

How each mesh type is measured



TRUE HEXAGONAL NETTING is measured from twist to twist. For irregular patterns two dimensions are given: the first from twist to twist, the second from one wire leg to opposite wire.

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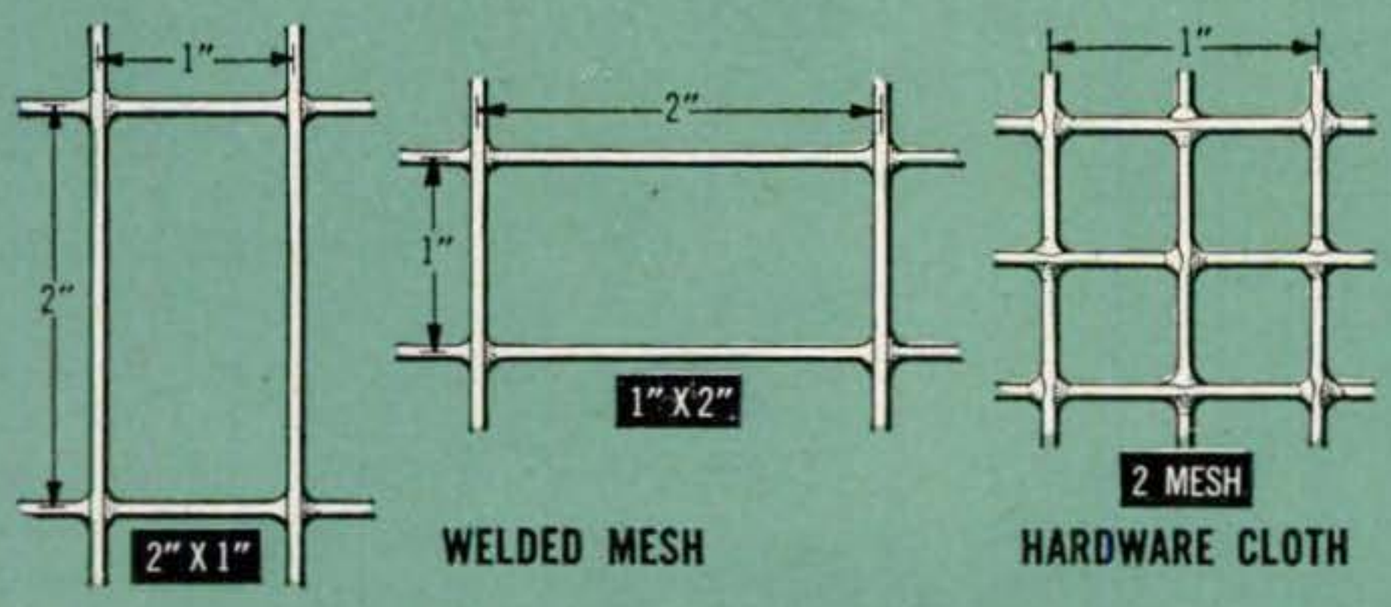
to Wire Mesh

chimney spark guards or devices near seashore salt spray, for example.

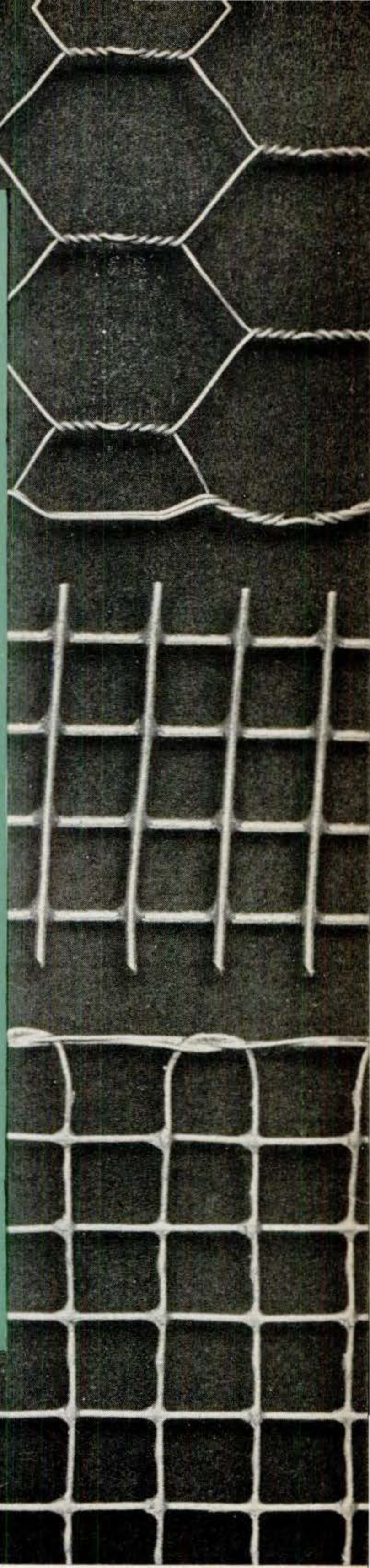
Hex netting (chicken wire). Lowest in price, hex netting has a give and stretch that welded-wire mesh and hardware cloth do not. As a baseball backstop or tennis-court enclosure, its cushioning ability drops even the fastest ball to the ground without bouncing it back.

The same flexibility makes it top choice as a plaster reinforcement to minimize cracking from sharp temperature or humidity changes during a plastering job. In earthquake areas it holds ceilings together and greatly reduces the danger of falling plaster.

Where appearance is important, this stretching quality is a drawback. Hex netting can't be drawn flat and taut over a framework as neatly as welded mesh or hardware cloth. You have to choose between beauty



For welded mesh, vertical distance between wires is given first, then horizontal. Hardware cloth is designated by number of square openings per inch or by actual measurement.



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WHAT SIZES TO USE

MESH AREA AND GAUGE OF THE WIRE are both given when you designate sizes of wire mesh, the mesh area first and the gauge second, as you see in the chart below. For an explanation of how mesh area is measured for different types, see the sketches on preceding pages.

	HEX NETTING	WELDED MESH	HARDWARE CLOTH
FOR FENCING:			
Lawns	2" 20	2"x2⅝" 16	2 mesh 19
Play area	1" 16	2"x1" 14	1 mesh 14
Flower bed	2" 20	2"x2⅝" 16	2 mesh 19
Vegetable garden	1" 20	1"x2" 16	2 mesh 19
Tennis court	1½" 18	1"x2" 16	¾x¾ 16
Baseball backstop	2" 14	1"x2" 14	1 mesh 14
FOR REINFORCING:			
Terrazzo floor	1½" 16	1"x1" 16	¾x¾ 16
Concrete floor	2" 16	1"x2" 16	¾x¾ 16
Stucco	1½" 16	1"x2" 16	2 mesh 19
Plaster	1" 20	1"x2" 16	3 mesh 21
Boiler insulation	1" 20	1"x2" 16	2 mesh 19
MISCELLANEOUS:			
Support for roof insulation	2" 20	2"x2⅝" 18	¾x¾ 16
Vegetable bins	1"x¾" 18	½"x1" 16	2 mesh 19
Chimney spark guards	—	½"x½" 16	2 mesh 16
Rain-gutter guards	—	—	4 mesh 23
Basement partitions, wire	1" 20	1"x2" 16	¾x¾ 16
Trellises	2" 18	2"x2⅝" 18	¾x¾ 16
Brazier grilles	—	½"x1" 16	—
Rubbish burners	—	1"x2" 14	—
Screen-door guards	—	1"x1" 16	2 mesh 19
Machinery guards	—	½"x1" 16	⅝x⅝ 14
Window guards	1"x¾" 18	1"x1" 16	¾x¾ 16
Tree guards	—	½"x1" 16	3 mesh 21
Attic-fan guards	—	½"x1" 16	2 mesh 16
Bird cages	—	½"x2" 16	—

and your budget for decorative jobs.

Welded wire has the handsomest appearance of the three. Wires run straight, without weaving over and under one another. The galvanized finish is smooth and lustrous. It looks appropriate as a cabinet grille, either as it comes or with a coat of paint over a zinc primer.

Even direct flame won't melt the welded joints, so you can build a rubbish burner or charcoal grill with it. If you want a large brazier, use welded-wire loop fencing (ornamental wire fence)—it comes in heavier (9½-gauge) wire.

The wire in welded mesh is stiff. If you bend it into shapes, make the shapes as simple as possible.

A rectangular wire mesh—which costs less than comparable square mesh, incidentally—makes a fence that youngsters can't climb. The vertical wires are no more than an inch to an inch-and-a-half apart, leaving scant room for the toes of a young climber.

Special types of welded mesh and ornamental wire are made for this kind of fencing. Some are sold by the foot, others by the 50- to 150-foot roll.

Hardware cloth. Most pliable because it's generally softest, hardware cloth is best for complex shapes: wire baskets, small cages, traps. It's also the material to use where small, strong mesh is needed. Hardware cloth comes with a mesh as small as eight squares per inch, compared to the ½"-by-½" minimum in welded mesh.

Though its zinc-soldered joints won't stand up under direct flame, hardware cloth is easily formed into such devices as spark guards. It holds its weave even after its galvanized coating is melted.

Special types of mesh. Very heavy wire fencing and fabric is widely used industrially, but don't expect to find it in stock at a hardware store. Your hardware dealer will order it, however, if you know exactly what you want after checking the manufacturer's catalogue.

Two grades of galvanizing. Hex netting and some types of welded mesh and ornamental wire fencing are made in two rustproof grades. An economy grade is galvanized before weaving or welding. A top durability grade is galvanized after the wire strands are joined; it has a zinc coating six times as thick as that on the economy grade.

Any hardware cloth you buy is necessarily coated with an extra-thick layer of zinc. It must be galvanized after the strands are laid in place because the zinc actually solders the wires where they cross. This holds the weave and gives the material much of its flexible strength.

Where you have a choice, use the econ-

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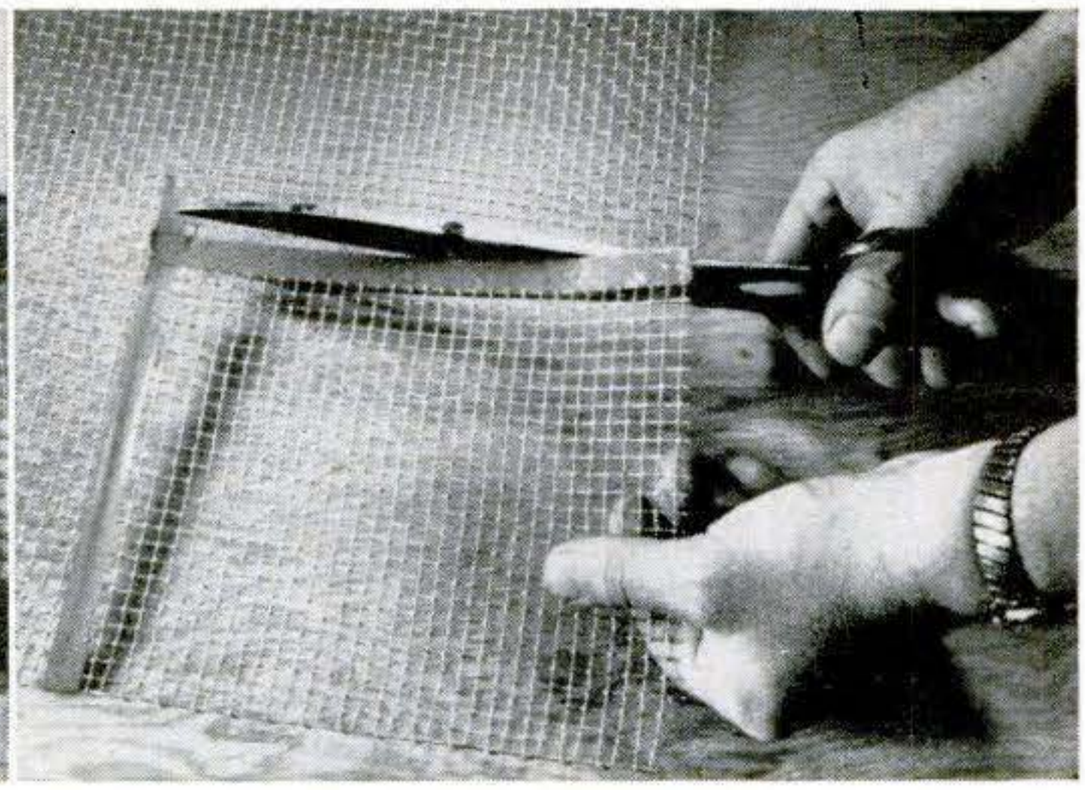
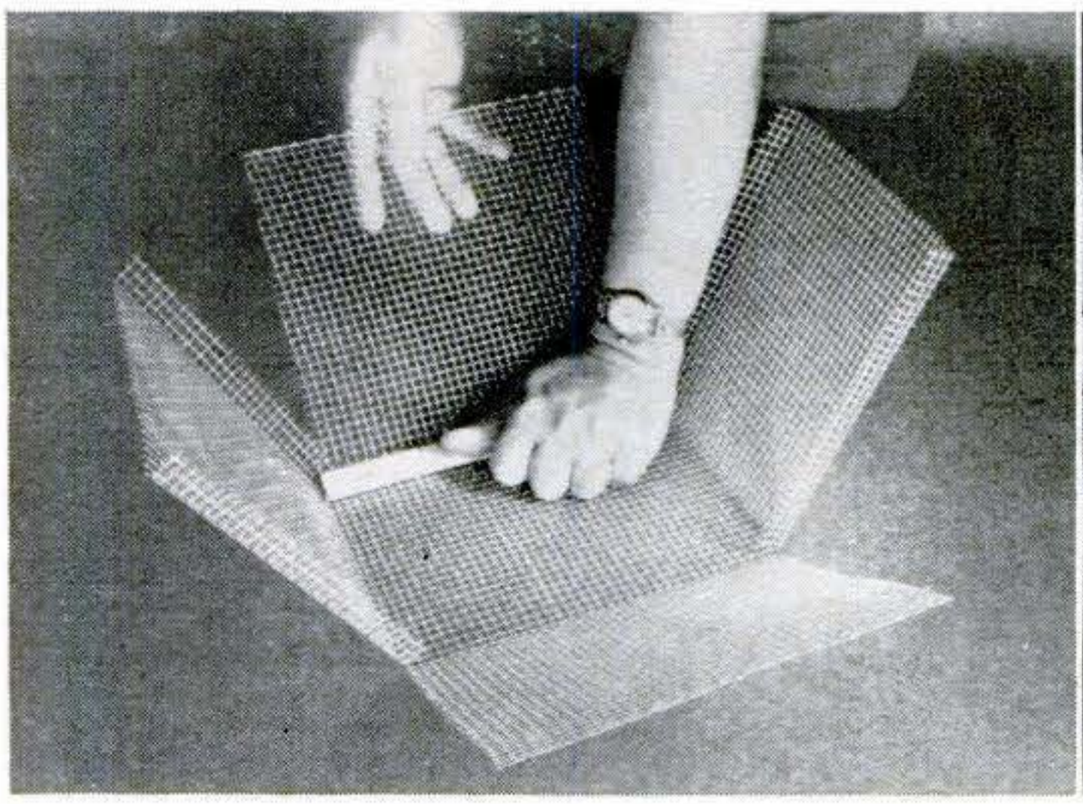
How to work with hardware cloth

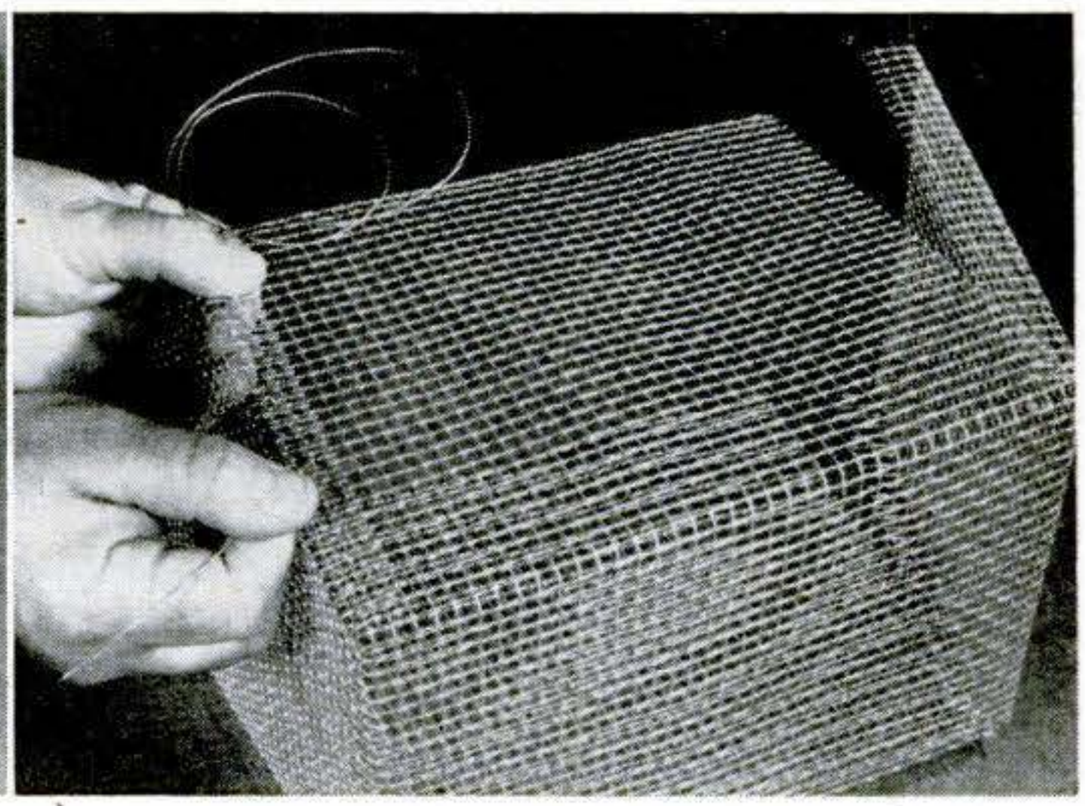
USE A RULER as a cutting guide for a precise job; wires don't always run as straight as they look. Square the job with finished edge of material. Mark the line with masking tape.



OLD PAIR OF LARGE SCISSORS works fine for straight-line cutting. But be careful of the cut edges. You may want to don light gloves to ward off the possibility of getting scratched.

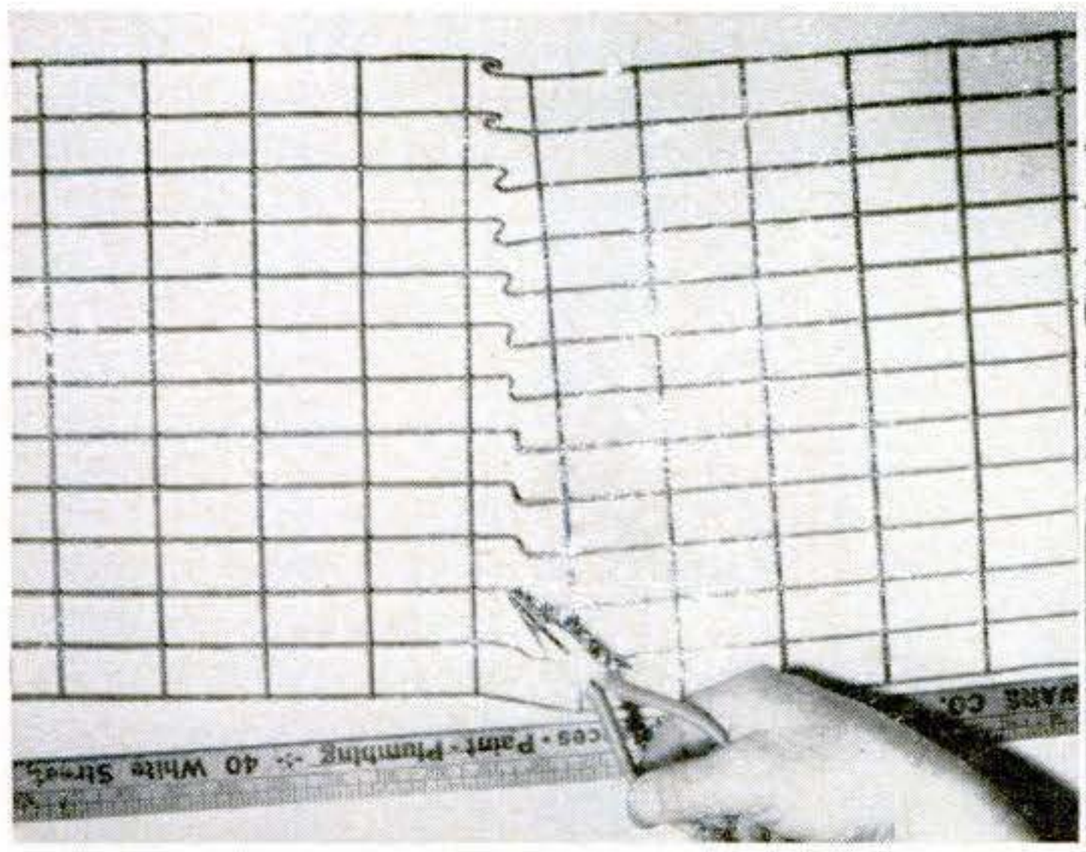


MAKE STRAIGHT BENDS by using straight-edge wood strips. Always try to make a bend between the wires that run parallel to it. Bending where wires cross may loosen joints.

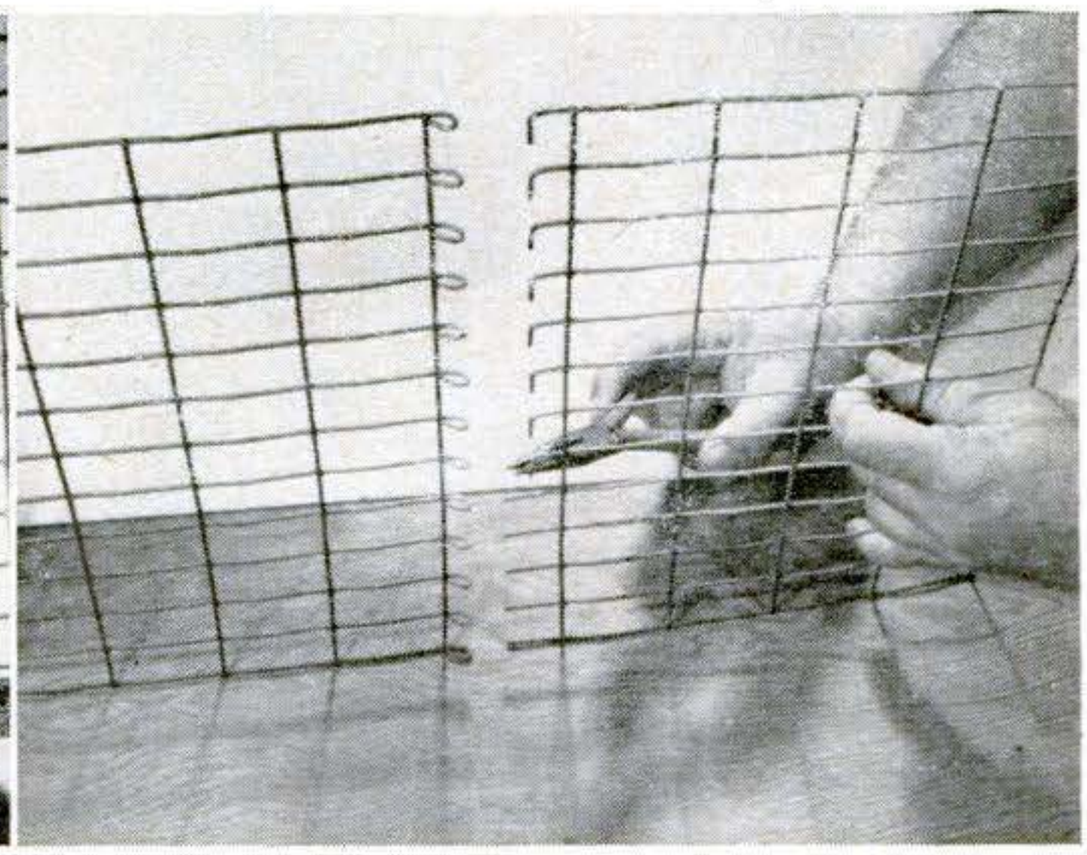


LACE SEAMS TOGETHER, with same kind of wire the netting is made of, and you've a useful spark guard for chimney. Same kind of wire is used to avoid destructive electrolytic action.

How to work with welded mesh



CRIMPING WIRE angles it to follow the contour of hilly terrain, eliminating the need to cut and lace several separate pieces together.



A GATE can be made by cutting the horizontal wires midway between vertical ones and bending the cut ends as shown in the photograph.

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Shopping facts about wire mesh

Hex netting. You can buy this in 150′ rolls of the following widths: 12″, 18″, 24″, 36″, 48″, 60″ and 72″. Common mesh openings include 2″, 1½″, 1″, 1″ by ¾″ and 1″ by ½″. A 150′ roll of 20-gauge hex netting 48″ wide costs about $12 with a 2″ mesh opening. The same size roll of netting with a 1″ mesh opening comes to about $23.

Welded mesh. A 100′ length is most common, with widths of 12″, 15″, 18″, 24″, 30″, 36″ and 48″. The 15″ width doesn't come in all mesh sizes. Mesh openings include: 2″ by 2⅝″, 1″ by 2″, 2″ by 1″, 1″ by 1½″, 1″ by 1″, ½″ by 2″, ½″ by 1″ and ½″ by ½″. Very heavy gauge fencing comes in 4″-by-2″ mesh and larger. You pay about $27 for a 100′ roll of 16-gauge welded mesh 48″ wide with a 1″-by-2″ mesh opening. A roll the same size with a 1″-by-1″ opening costs about $29.

Hardware cloth. Also commonly made up in 100′ rolls, this type wire comes in widths of 24″, 30″, 36″ and 48″. Not all sizes come 30″ wide, but some heavy-gauge cloth comes 60″ and 72″ wide. Common mesh openings include: ¾-by-¾ mesh, ⅝-by-⅝ mesh, 1 mesh, 2 mesh, 3 mesh, 4 mesh and 8 mesh. For a 100′ roll of 19-gauge cloth 36″ wide having 2-mesh openings, expect to pay about $32. A roll the same length and width, but 23 gauge and 4 mesh costs in the neighborhood of $37.

omy grade for temporary things like an enclosure for newborn pups or for indoor use as on vegetable bins. For permanent outdoor applications you will want the "galvanized-after" grade.

Working with wire mesh. Tin snips or an old pair of large scissors will easily cut through lightweight hex netting or hardware cloth. Scissors cut a straighter edge because their blades are longer. The heavier-gauge wire, including most welded mesh, won't yield to anything less than tin snips or wire cutters.

In farm country, hex netting is usually fastened to a framework or post with galvanized nails driven in halfway and clinched over the wire. When there's a lot of fencing to be done nails go in faster than staples, but staples make a neater-looking job.

Both staples and nails give maximum holding power when driven where mesh wires intersect.

Fencing for poultry and small animals should be fastened every 6″, with the mesh drawn taut to prevent gaps between it and the framing. For dogs, space the fasteners 4″ apart and reinforce the line of fasteners with a wood molding. Screw the molding to the enclosure framing at one-foot intervals.

If an enclosure has no floor, the mesh should be carried across the bottom to prevent animals from burrowing under the sides. Cover all cut edges inside the enclosure with wood strips, to prevent injuries.

Post spacing for welded-mesh or hardware-cloth lawn fencing should be about 8′ on centers. Around play areas better make it 6′ between posts. The same goes for welded loop fencing.

Low mesh or loop fencing up to 24″ wide, often used around circular flower beds, will stay up in most cases without posts or stakes. A special border fencing for flower beds is made of 18″-wide mesh and often sold in 50′ rolls, with enough wire stakes for 4½-foot spacing. This kind can be rolled up for the winter, stakes and all, and stored away until the next spring.

Wire mesh used as lawn fencing makes an attractive support for climbing vines. Mounted vertically on the side of a building, the mesh serves equally well as a purely decorative trellis.

A word of caution on working with any wire mesh: The cut ends can inflict painful scratches and punctures. A thin pair of leather gloves will guard you against most of these minor hazards. END

Irons usually outlive cords several times over. Next time an iron in your home needs a cord repaired, why not do the job yourself? Save this data sheet and use it as your guide. It's one of a series of helpful fix-it sheets appearing each month in POPULAR SCIENCE.

Next month: Chair repairs.

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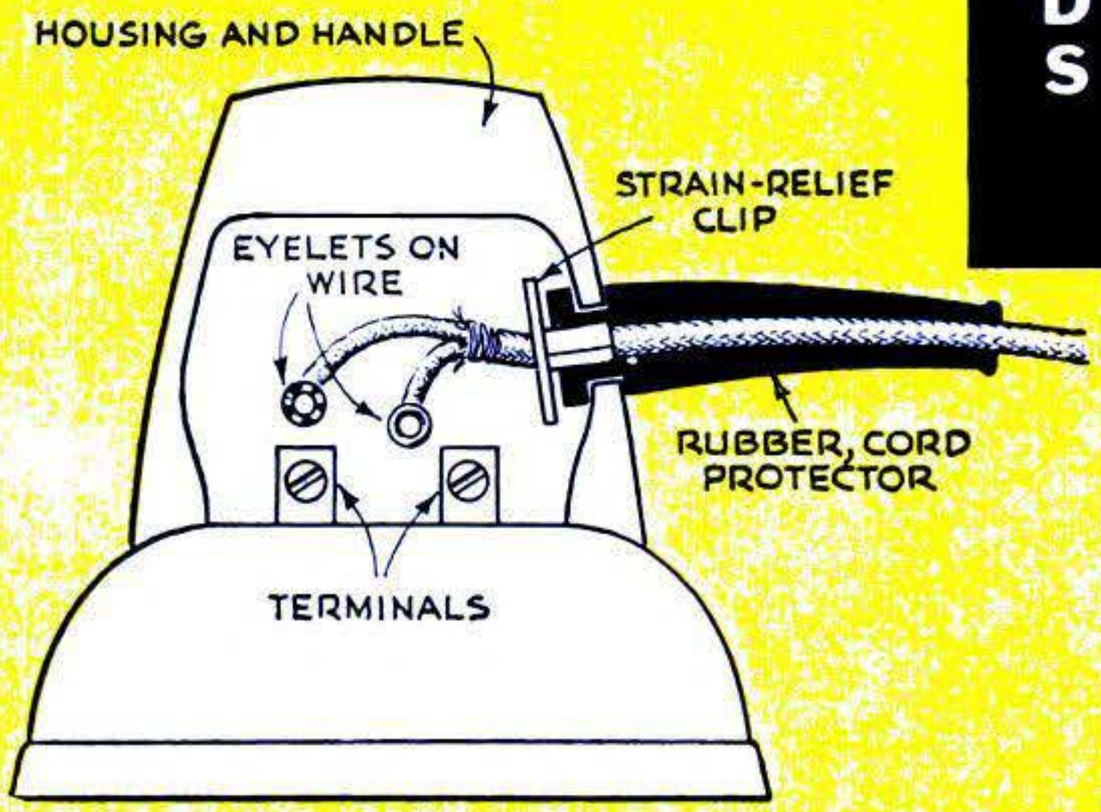
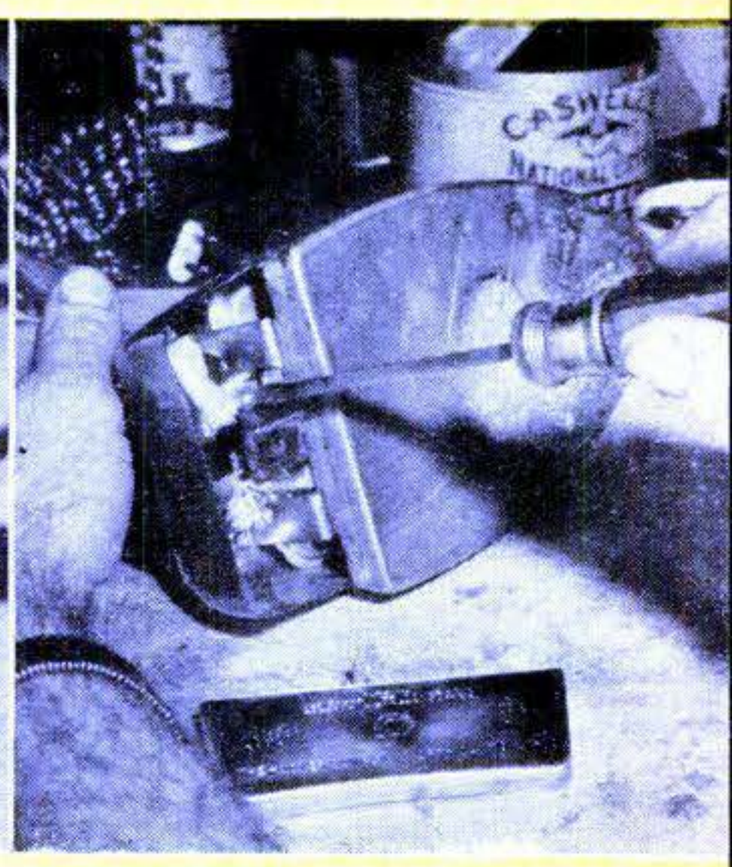
Popular Science Fix-It File

A NEW CORD with asbestos insulation, a rubber or plastic plug at one end and brass eyelets at the other is best for replacement of old cord with frayed insulation, broken wire or damaged plug. Buy 16-gauge wire, not the smaller 18-gauge, if there's a choice. For the few irons that still use detachable cord with female plug at the iron end, a new cord is also the safest and simplest repair. You can get new cords from electrical-supply stores or also through mail-order houses.

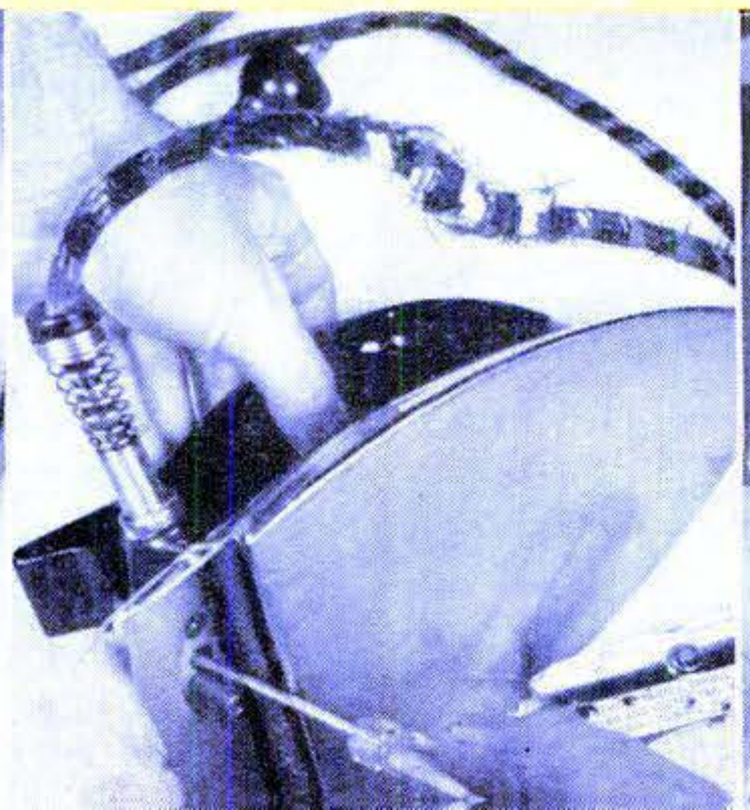
CORD IS PROTECTED on most irons by a strain-relief clip inside and a rubber or coil-spring guard around the cord at the point where it enters the iron.

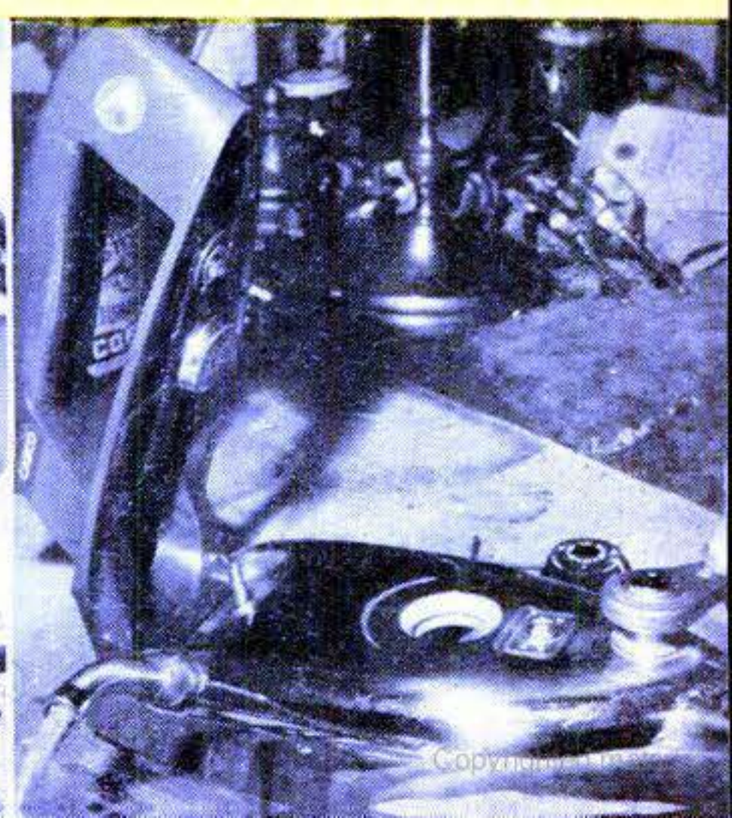


How to remove the damaged cord from the iron

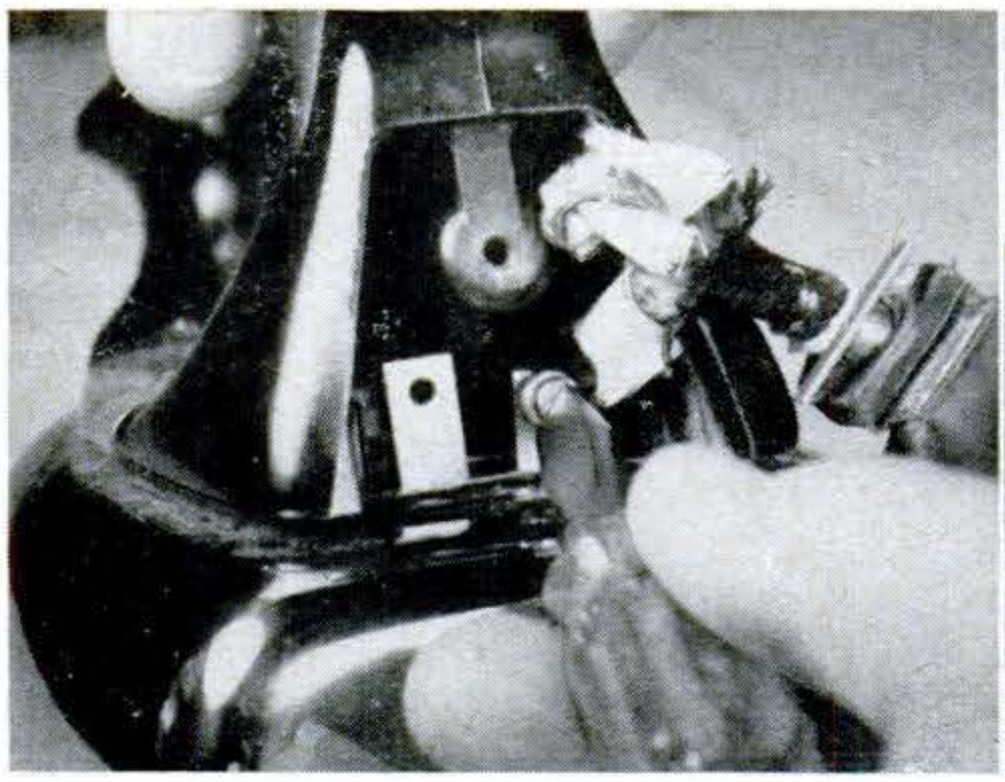


GETTING AT THE TERMINALS varies with the iron—as you can see in these typical assemblies. In No. 1, removal of cover plate reveals terminals in a cavity in handle. Slip a knife or screwdriver under the nameplate of No. 2 and pry it loose. Cover plate under the body hides the terminals in No. 3. Where you find no cover plate, chances are the upper part of iron must be removed (No. 4). After removing nameplate in No. 5, reach through holes as shown and loosen two screws. For the steam iron in No. 6, turn up handle after loosening fastener at front. Then use Allen wrench to remove dial at rear and another wrench (as shown) to unscrew nut at front. Shell can then be lifted up.

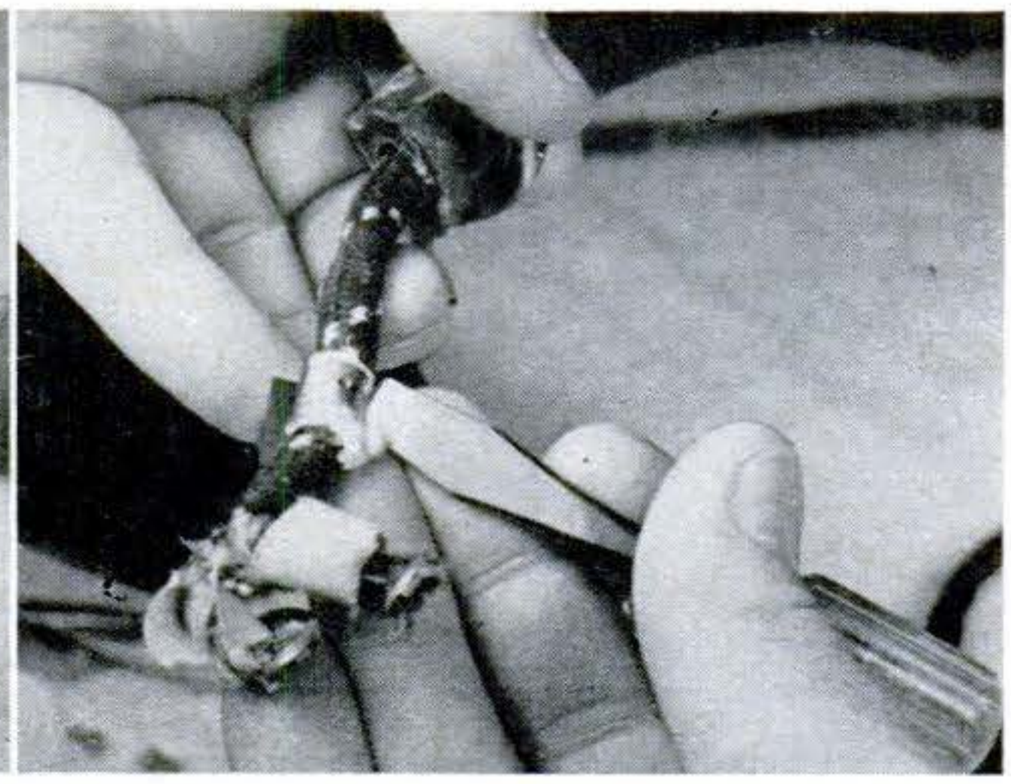




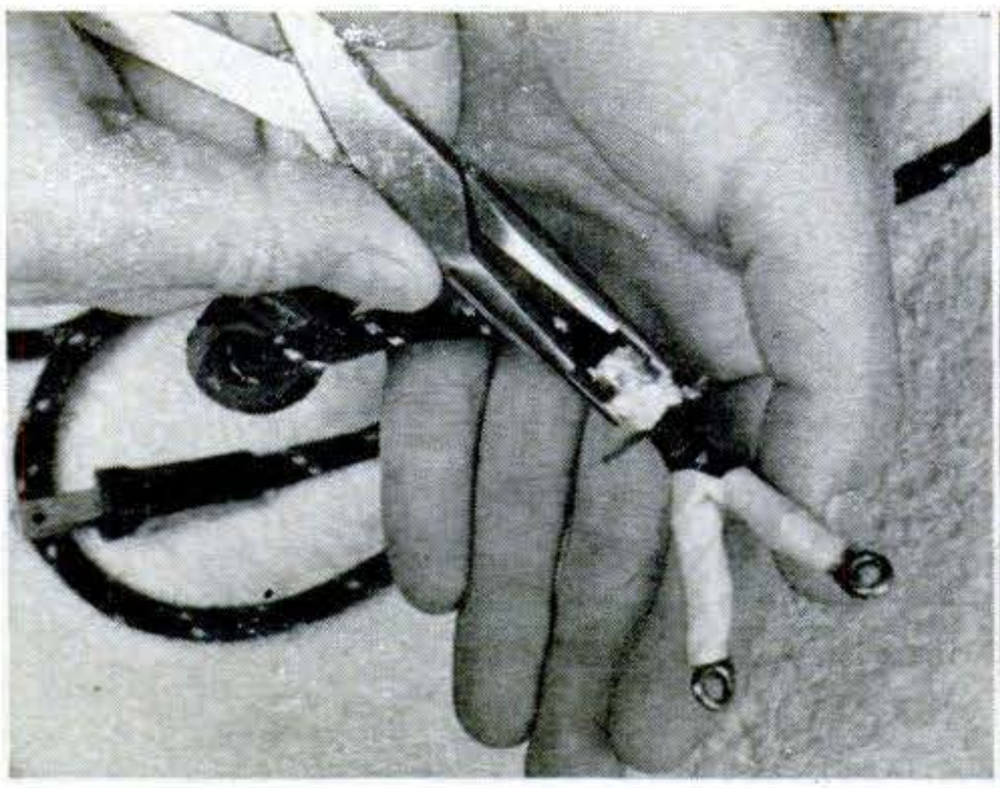
How to put in the new cord



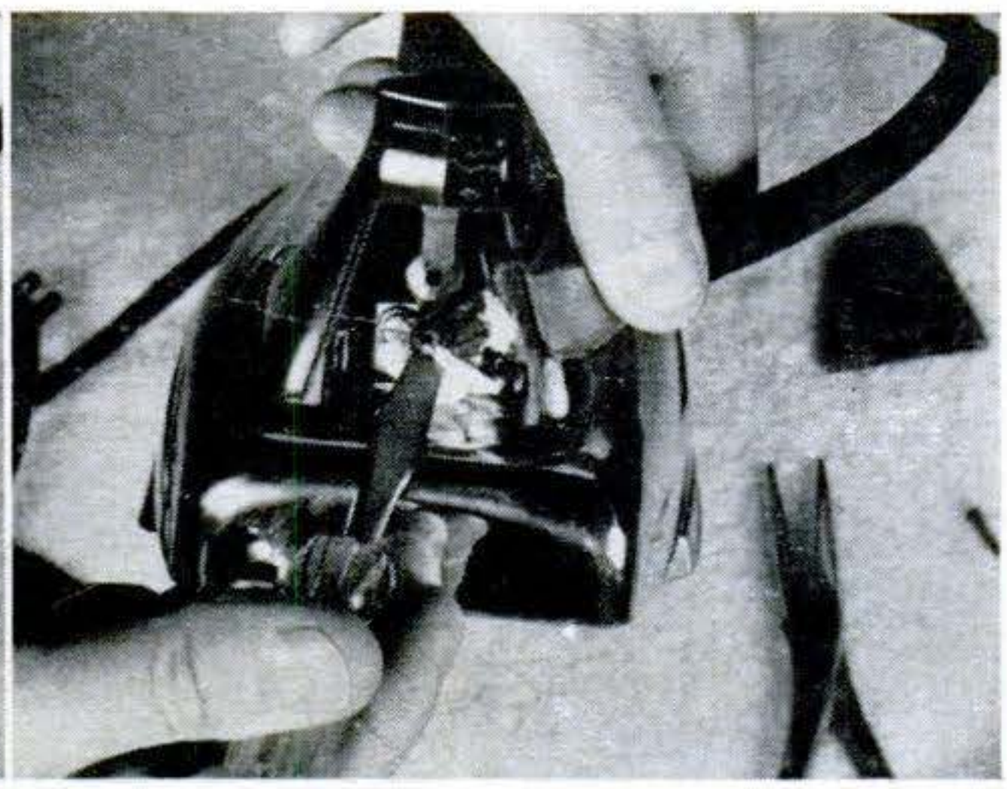
UNSCREW TERMINAL SCREWS to remove the old cord. If the terminals are burned or pitted, brighten them with fine sandpaper and replace terminal screws with new ones.



PRY OPEN THE STRAIN-RELIEF CLIP—the gadget that keeps the pull off the terminals. Slide the clip off the cord, then pull the cord through the rubber cord-protector.

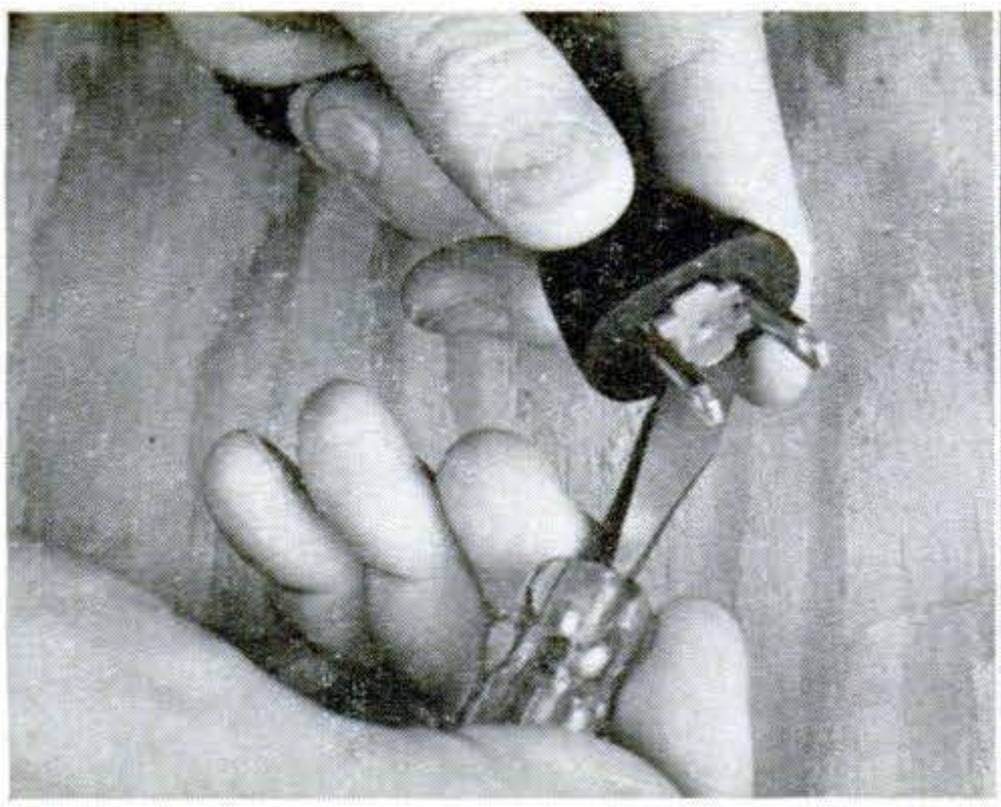


SLIP THE NEW CORD through the cord-protector and then slide the strain-relief clip up far enough to keep the wires slack at the terminals. Squeeze the clip on the cord.

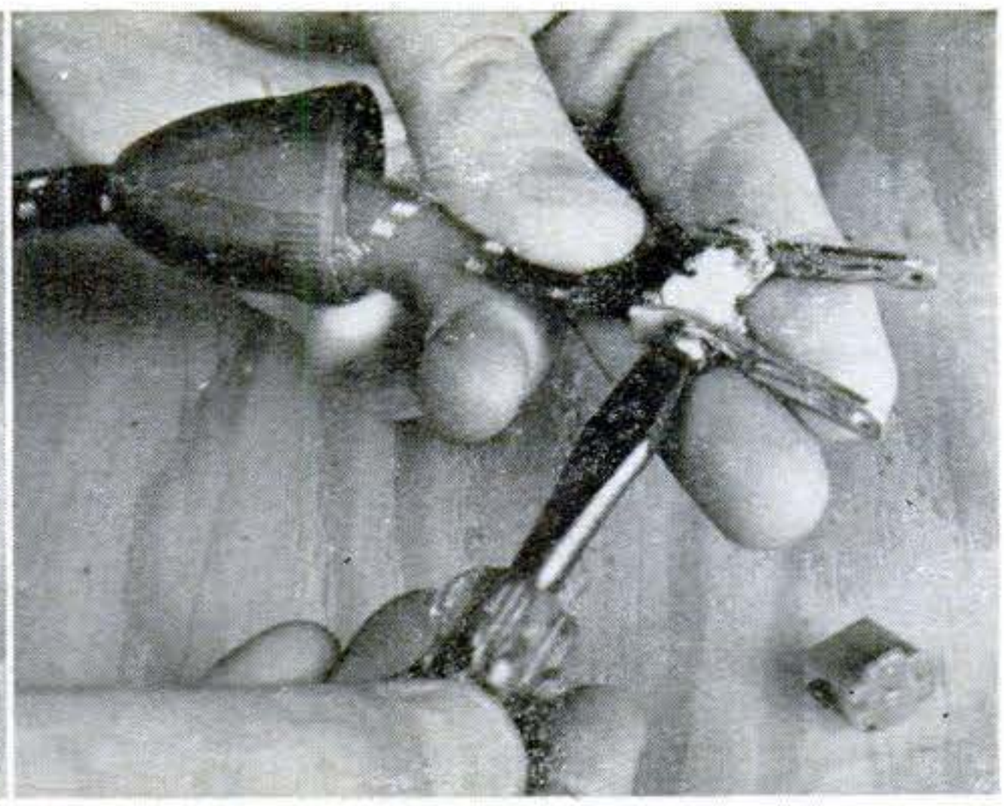


INSERT TERMINAL SCREWS in wire's eyelets and tighten them securely. Fit the strain-relief clip and the cord-protector in position in the handle and install cover plate.

Replacing a damaged plug



IF CORD IS IN GOOD CONDITION, and only the plug is damaged, replacing the latter will be sufficient. For the type of plug shown, pry the filler from between the prongs. Squeeze prongs together to release them



from plug, pull them out, and unscrew screws. Run cord through new plug, wrap the twisted ends of the wires clockwise around terminal screws and tighten the screws. Pull on cord to seat prongs. Replace the filler.

Popular Science Fix-It File

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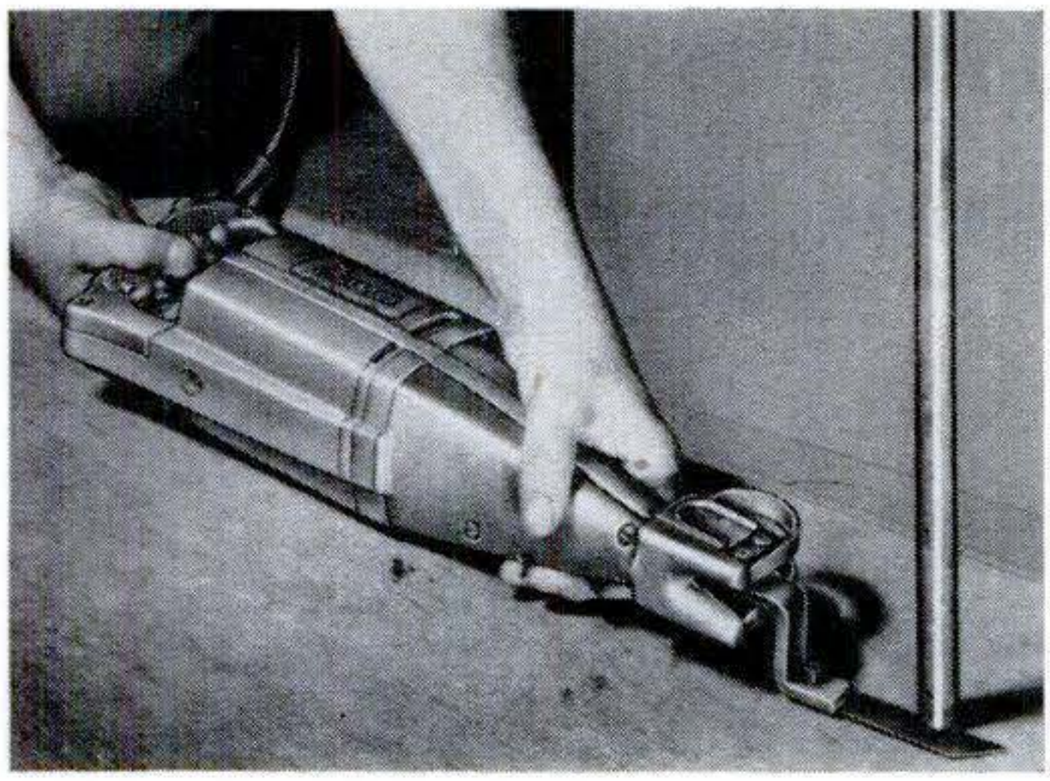
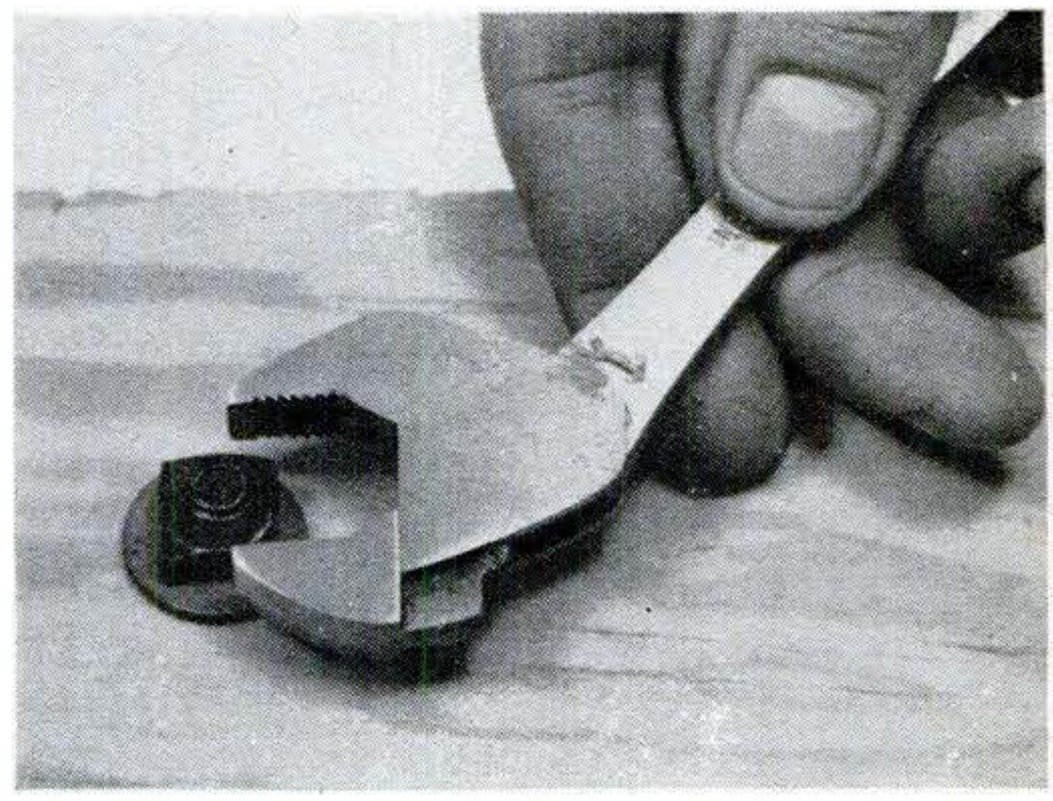
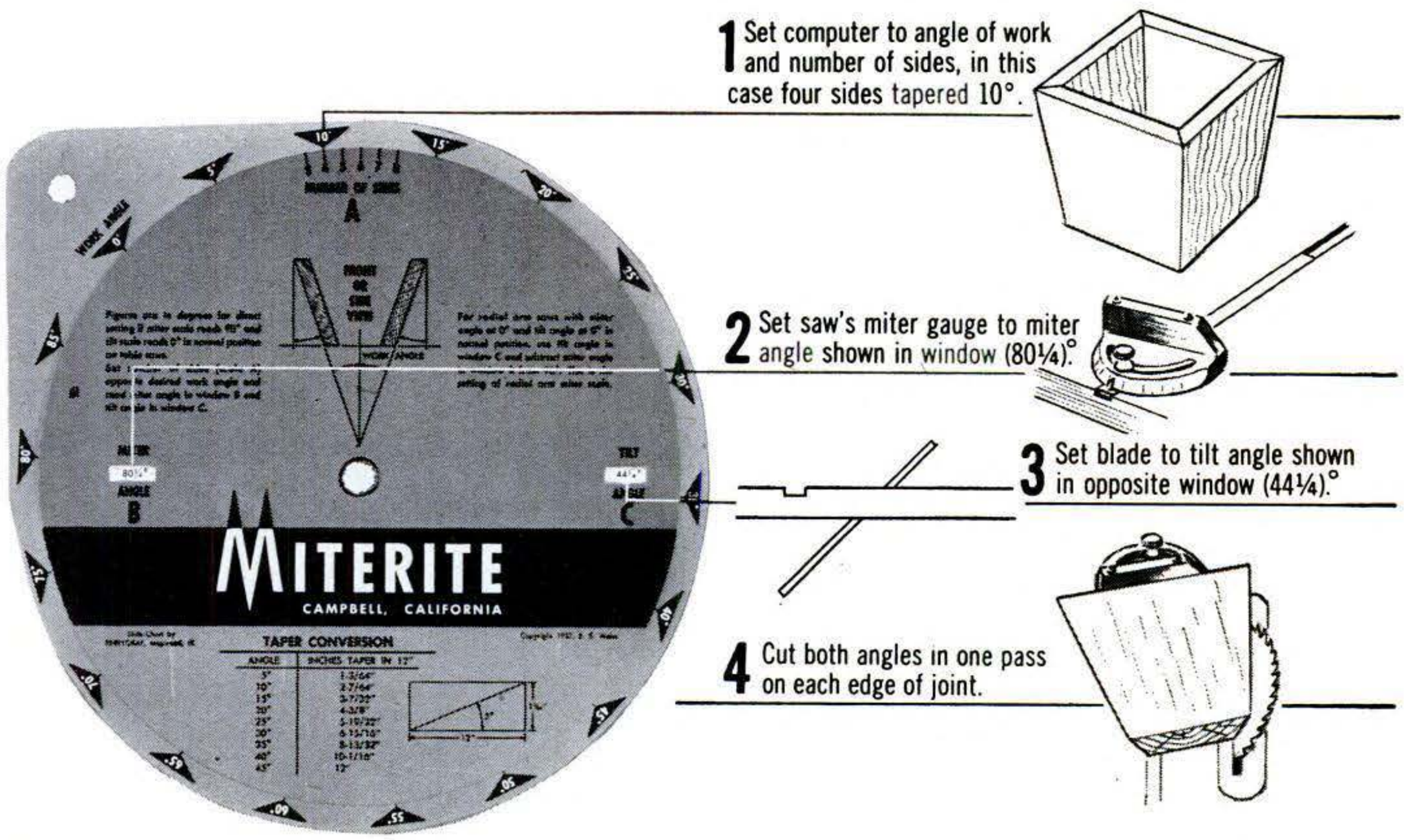


1. Saw Cuts Flush. The offset blade on this electric saw lets you make cuts in corners and flush with any surface. With it you can trim bolts, pipe, conduit and nails flush with the floor, or work between baseboards and wall to slice through nails. The offset arm is reversible for right- or left-hand cuts.



2. Wrench Is Self-Adjusting. Place the movable head of this wrench loosely over a nut or bolt, swing the handle, and the jaws automatically tighten. To loosen a nut, you flip the wrench over and swing the handle in the opposite direction. Three wrench sizes are available to handle work from 3/16″ to 1 9/16″.



3. Computer Figures Compound Angles. By rotating a disk and reading settings that automatically appear in two windows on this computer, you can easily get the angles for cutting compound joints in one pass. It provides all the angles for cutting shadow-box frames and straight or tapered boxes having up to eight sides. For example, if you want to make a four-sided box with sides tapered 10°, you (1) set the computer so the number of sides lines up with the work angle; (2) set the miter gauge to the angle given in the Miter Angle window; (3) tilt the blade to the angle given in the Tilt Angle window; (4) cut.

Please turn the page for more new tools

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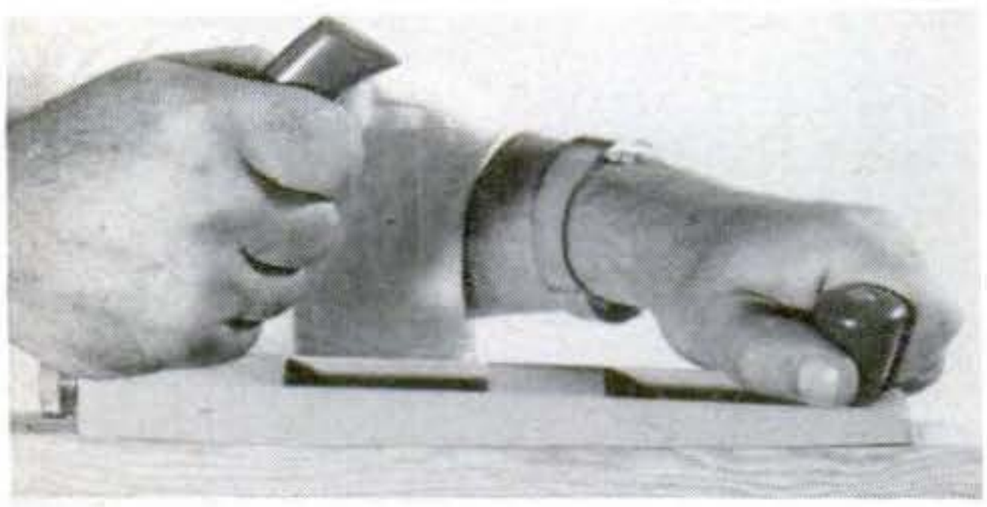
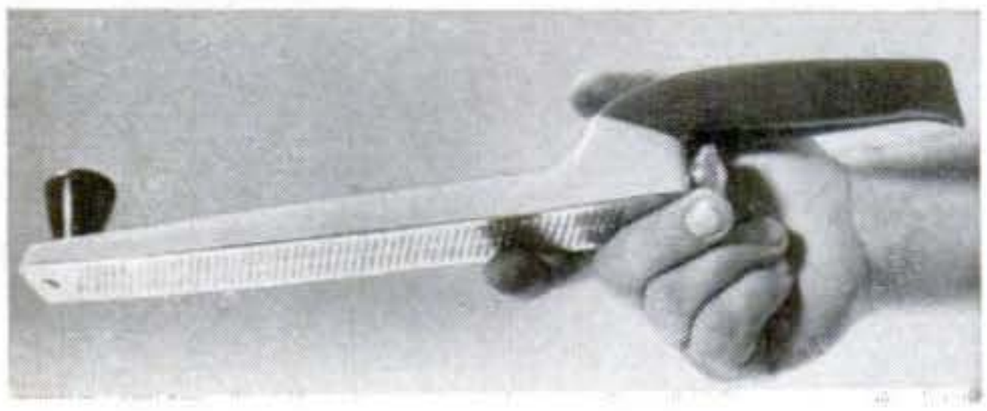
More New Tools

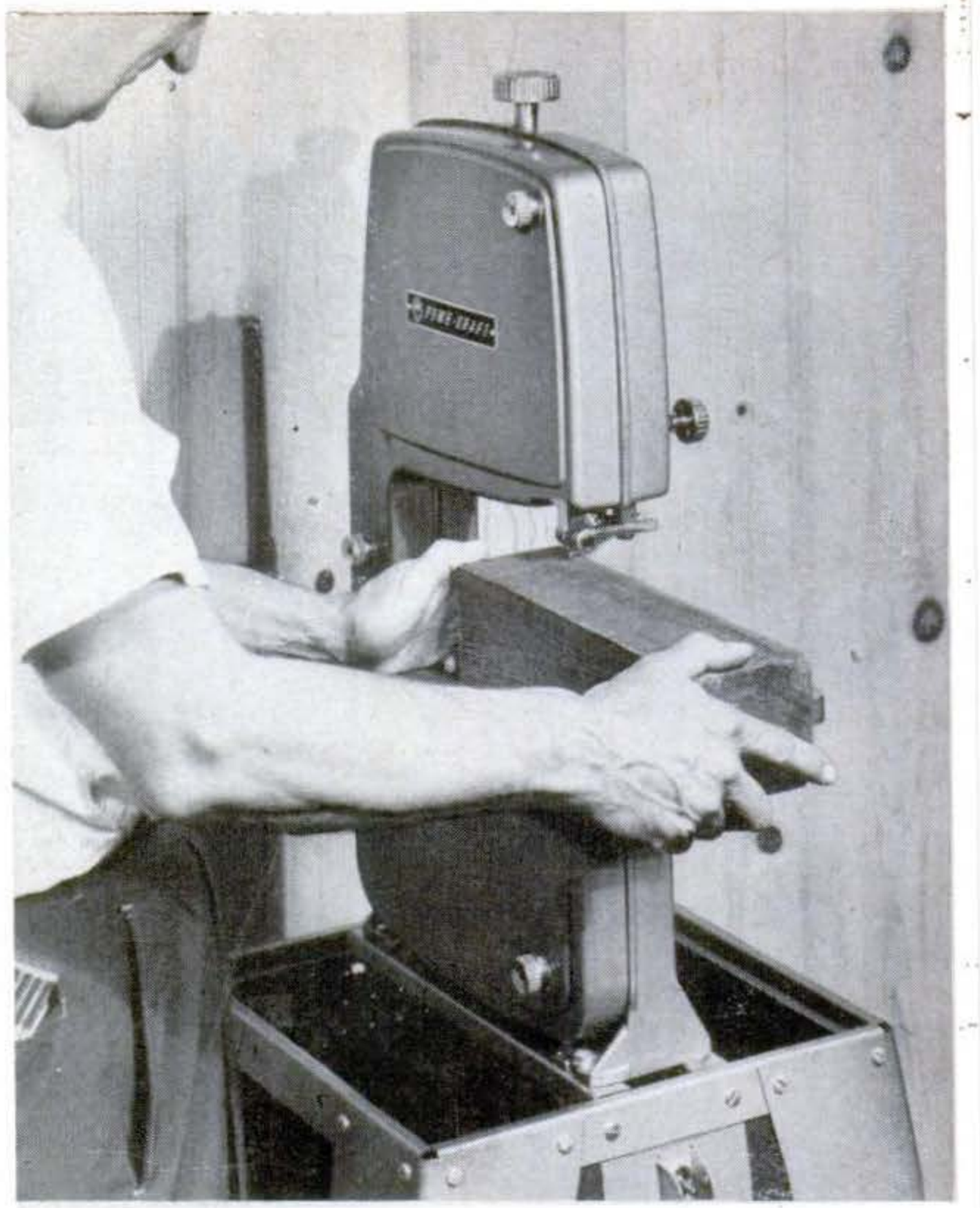
4. Handle Triggers Aerosol Bombs. You get better control of direction and spraying pattern with this pistol-grip handle that turns any pressure can into a spray gun. It instantly snaps in place on the cans and its sensitive trigger depresses the can's valve for light or heavy spraying.



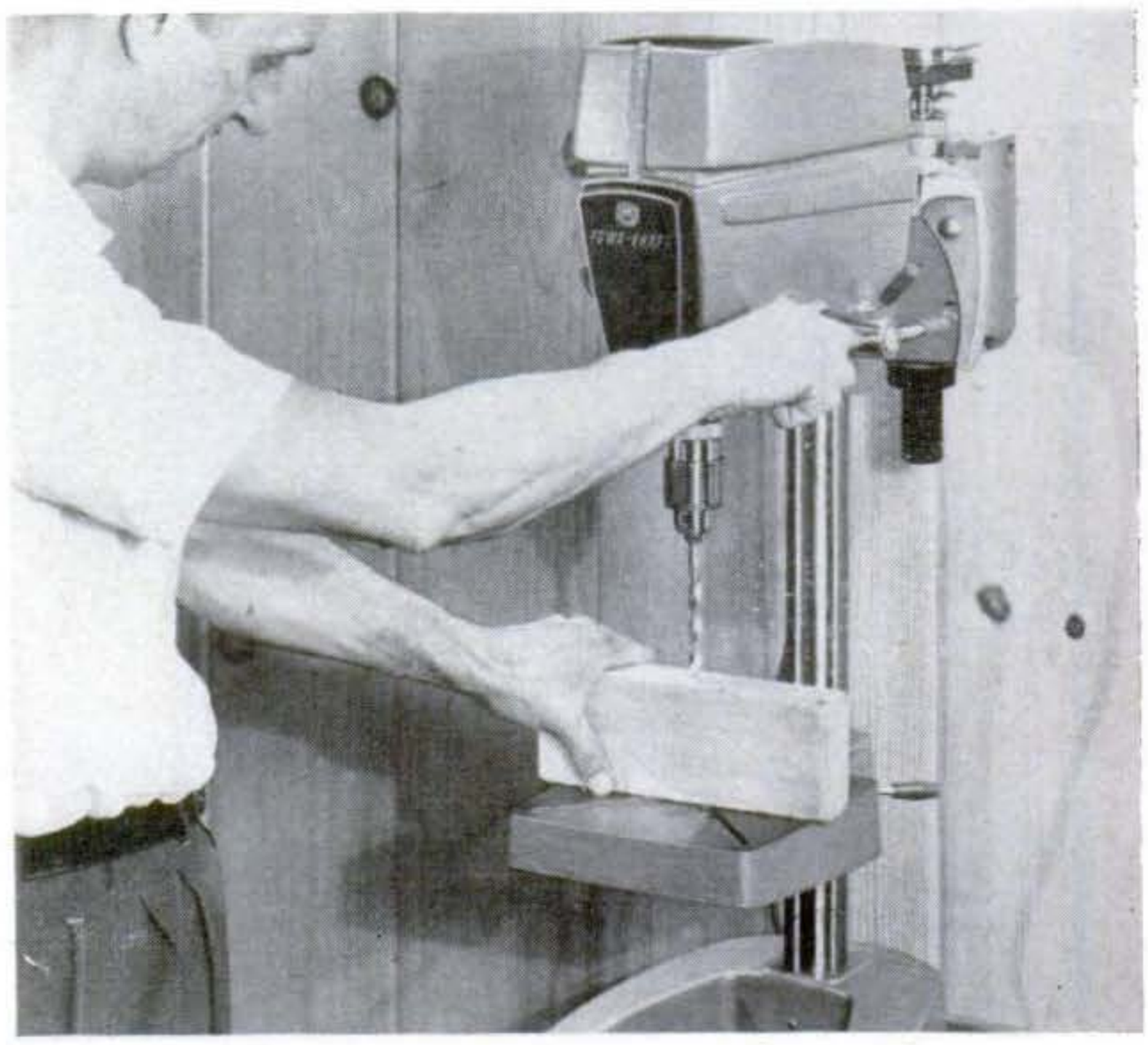
5. Handle Makes Plane a File. You handle this tool like a plane (above) when its handle is mounted vertically. Loosen a screw, swing the handle around (see below), and you have an in-line grip for filing. The expanded-metal blade smooths wood and steel, and hardened cutting edges are said to pass over nails and screws without being damaged. Blades are reversible.



More information *about the new tools shown on these pages can be obtained from: 1. R. C. S. Tool Corp., Box 661, Bloomington, Ill.; 2. Foreign Trade Development Corp., 350 Fifth Ave., NYC 1; 3. Miterite, 1459 Patio Drive, Campbell, Calif.; 4. Industrial Finishing Products, Inc., 465 Logan Street, Brooklyn 8, N.Y.; 5. Millers Falls Co., Greenfield, Mass.*



BANDSAW cuts stock up to 4" thick; has 9" work area between blade and frame. One-piece plastic blade cover simplifies change-over when switching from wood-cutting to metal-cutting blades. This outfit costs about $62.50.



DRILL PRESS has a cam motor mount for quick speed change and belt tensioning. Drilling depth is set by dialing a depth indicator. The head swings 360° on a safety support for drilling large work. Cost: about $65.

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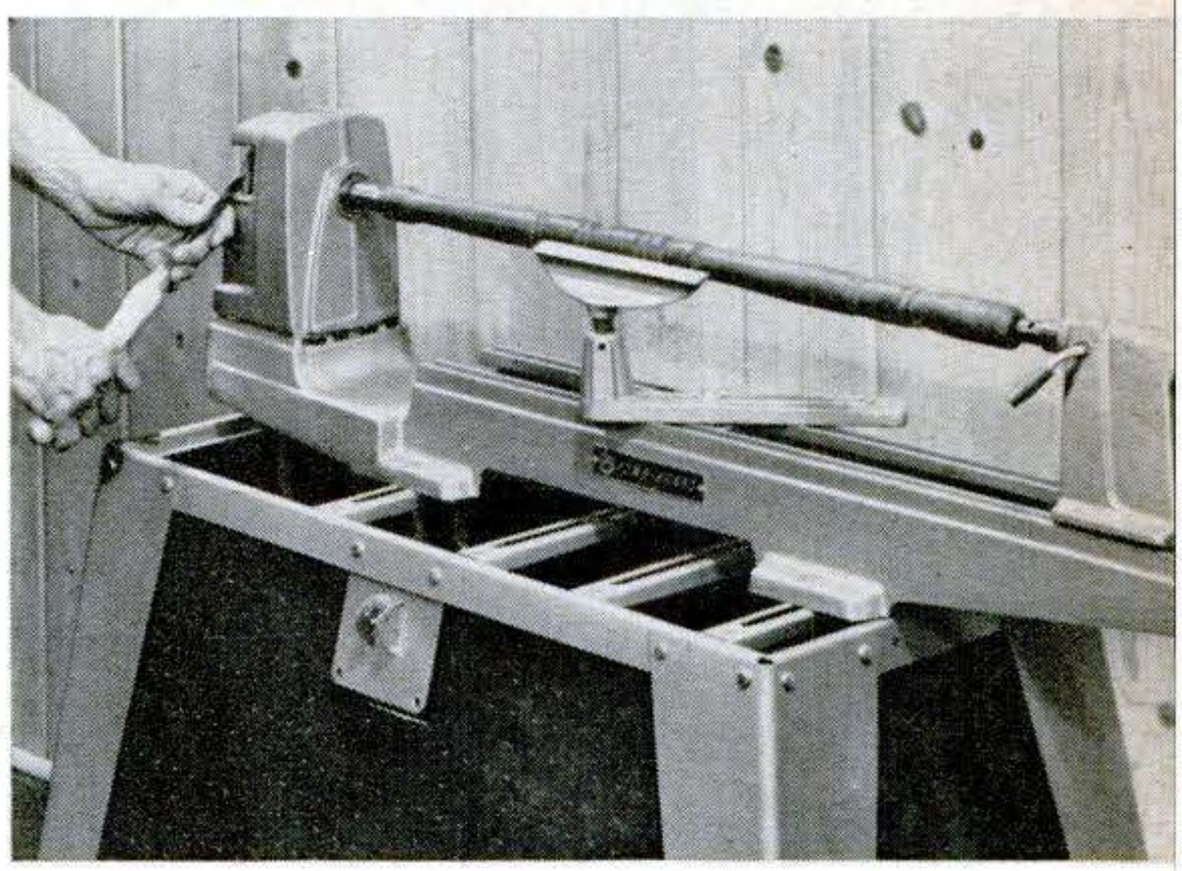
New Power Tools Are Styled for the Home

THE tools you'll see in the stores this fall would be attractive even in a recreation room or den. That's because makers are designing good looks into their tools. The latest to do so include Montgomery Ward & Co., and Delta Power Tool Division, Rockwell Mfg. Co.

Montgomery Ward engaged designer Robert Howey to style the new Power Kraft tools, then chose Magna Power Tool Corp. to manufacture them.

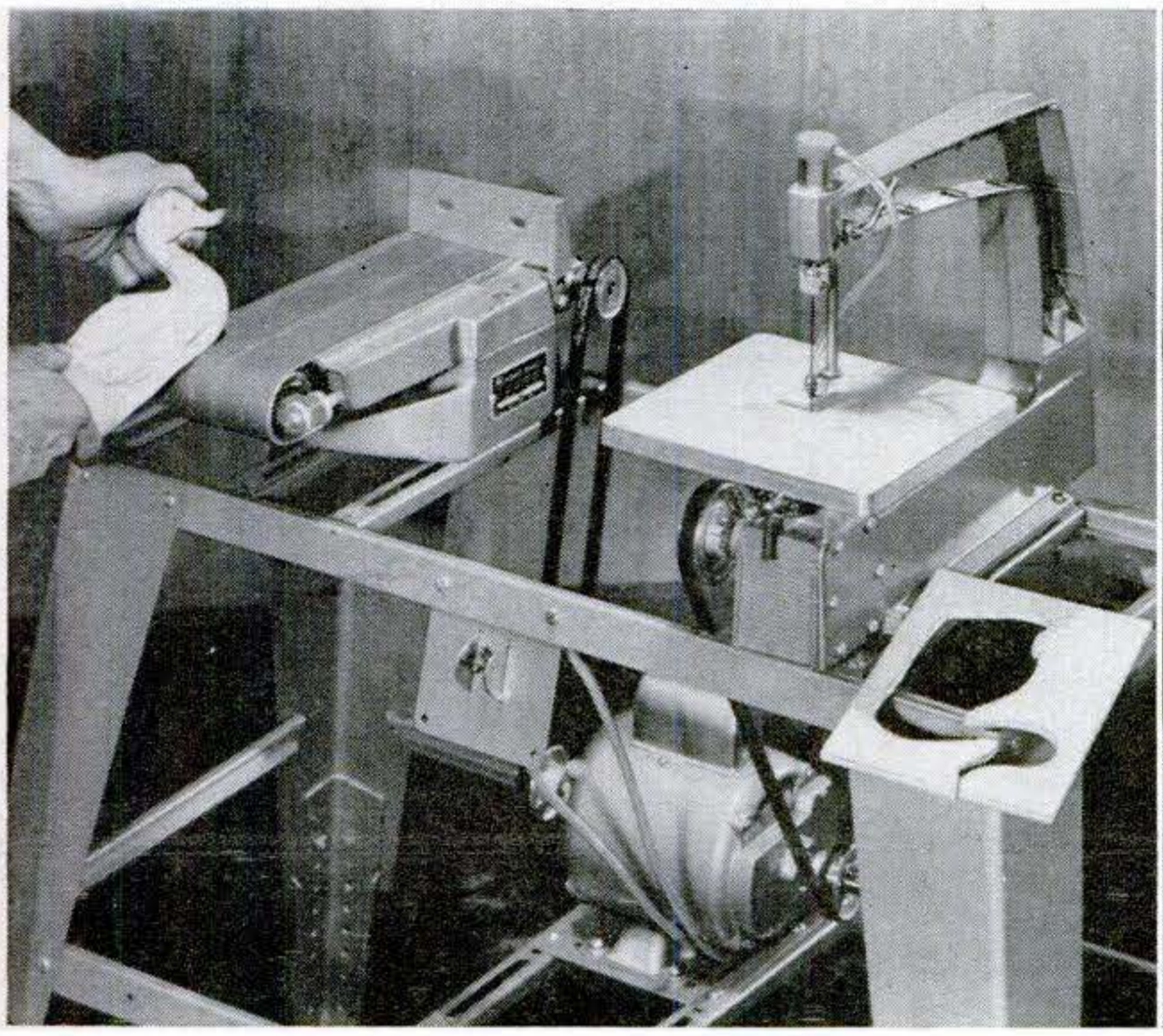
Industrial designer Raymond Loewy restyled the Delta Homecraft line in a new stainproof, mottled-gray finish. Four of the restyled tools—bandsaw, drill press, wood lathe and scroll saw—are shown on the following page.

Prices quoted here for the tools are approximate—*without* motor or stand.

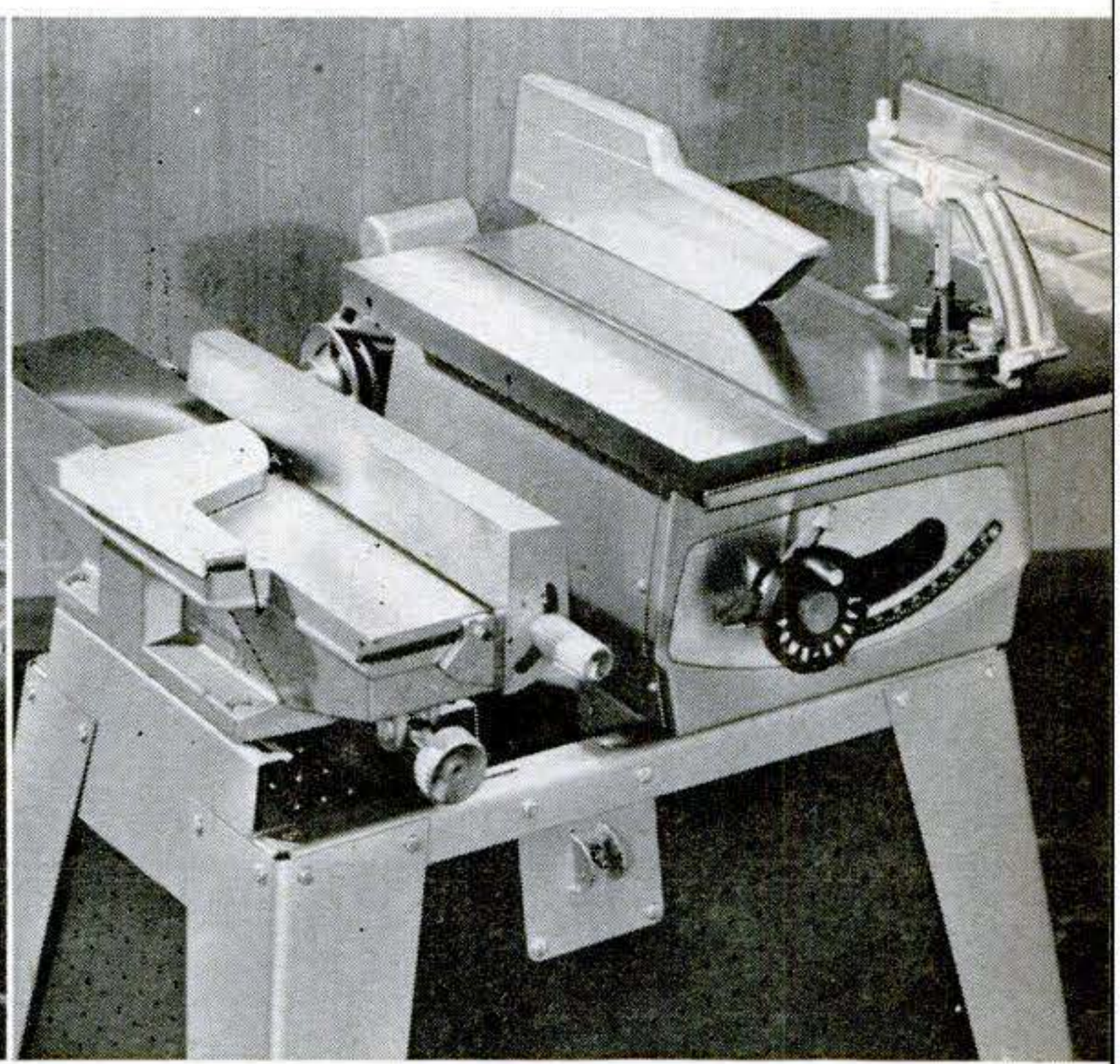


WOOD-TURNING LATHE has a built-in grinder for sharpening turning chisels. The tool handles work up to 9" in diameter and 30" long. A depression in the bed clears short turnings to 12" in diameter. Price: about $44.

MONTGOMERY WARD: ***Today's tools must NOT look "as if they belong in a blacksmith shop," the company said in announcing the new ones shown here***



BELT SANDER AND JIGSAW can be mounted on a single table designed to drive both with one motor, or they can be used separately. The saw's overarm is removable for large work. Sander about $18; jigsaw about $22.50.



9" BENCH SAW AND 4" JOINTER combination sells for about $195. The saw is also available in 8" and 10" sizes and can be bought separately. A single knob controls blade height and tilt. A clamp-on miter gauge grips the work.

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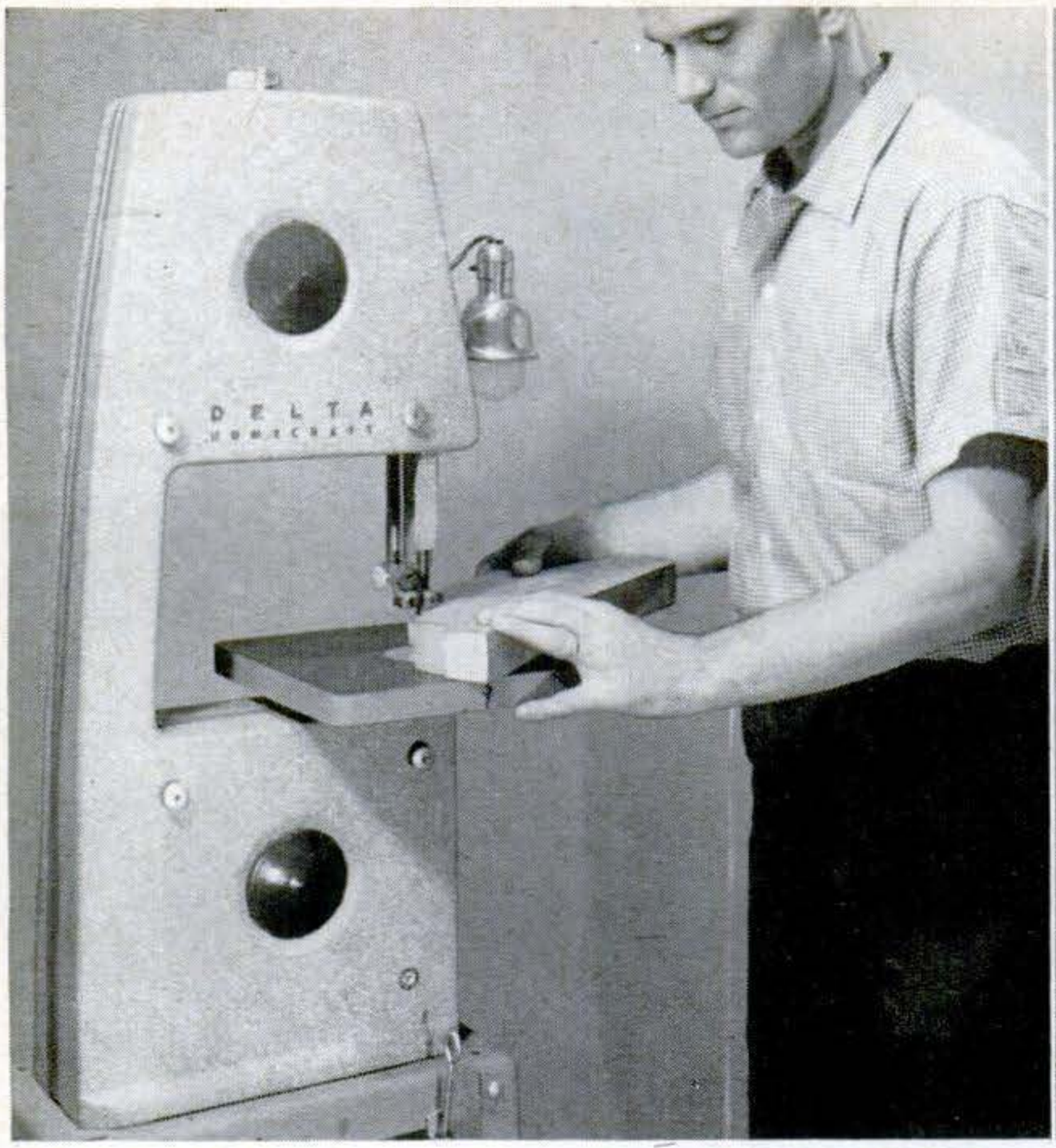
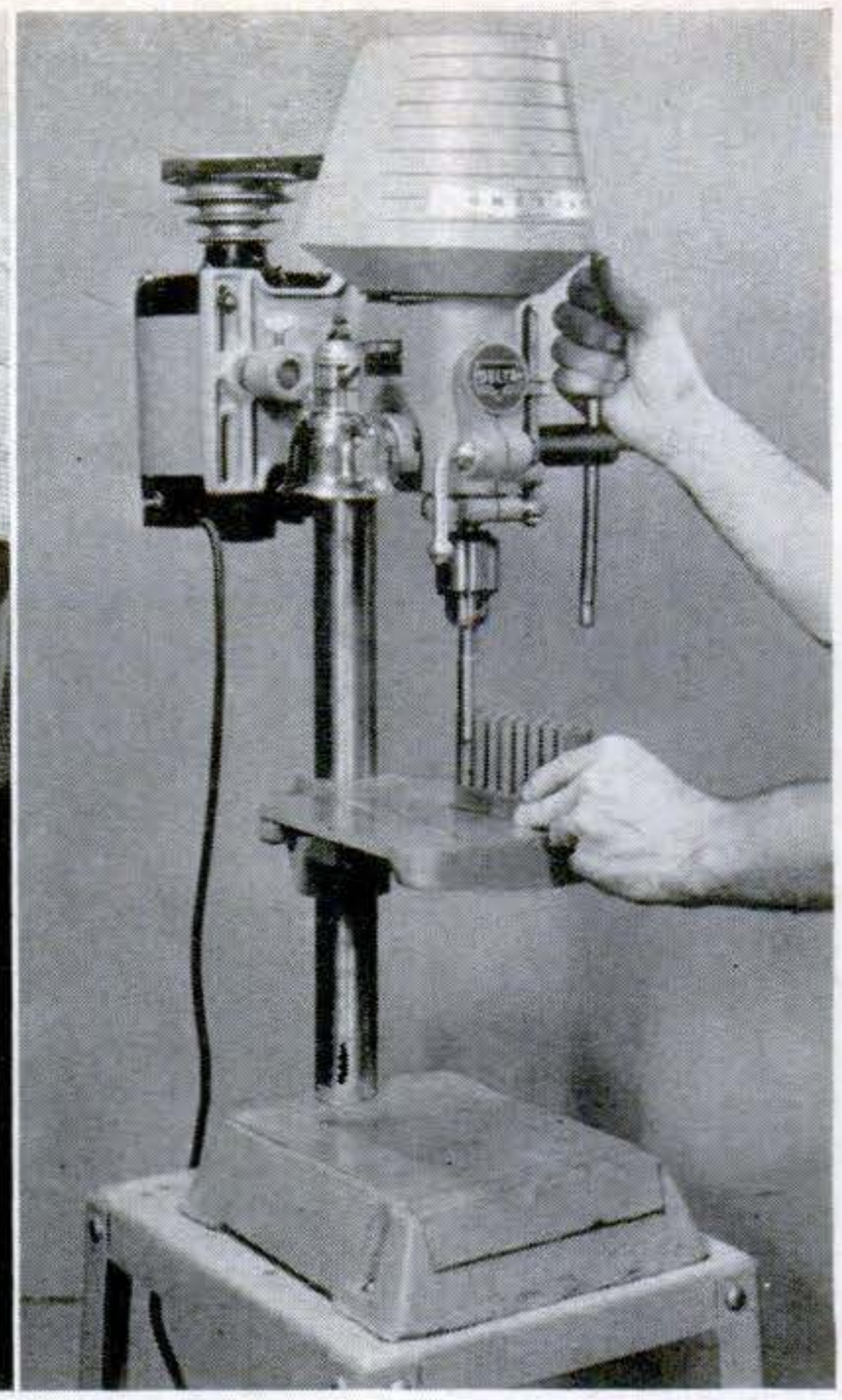
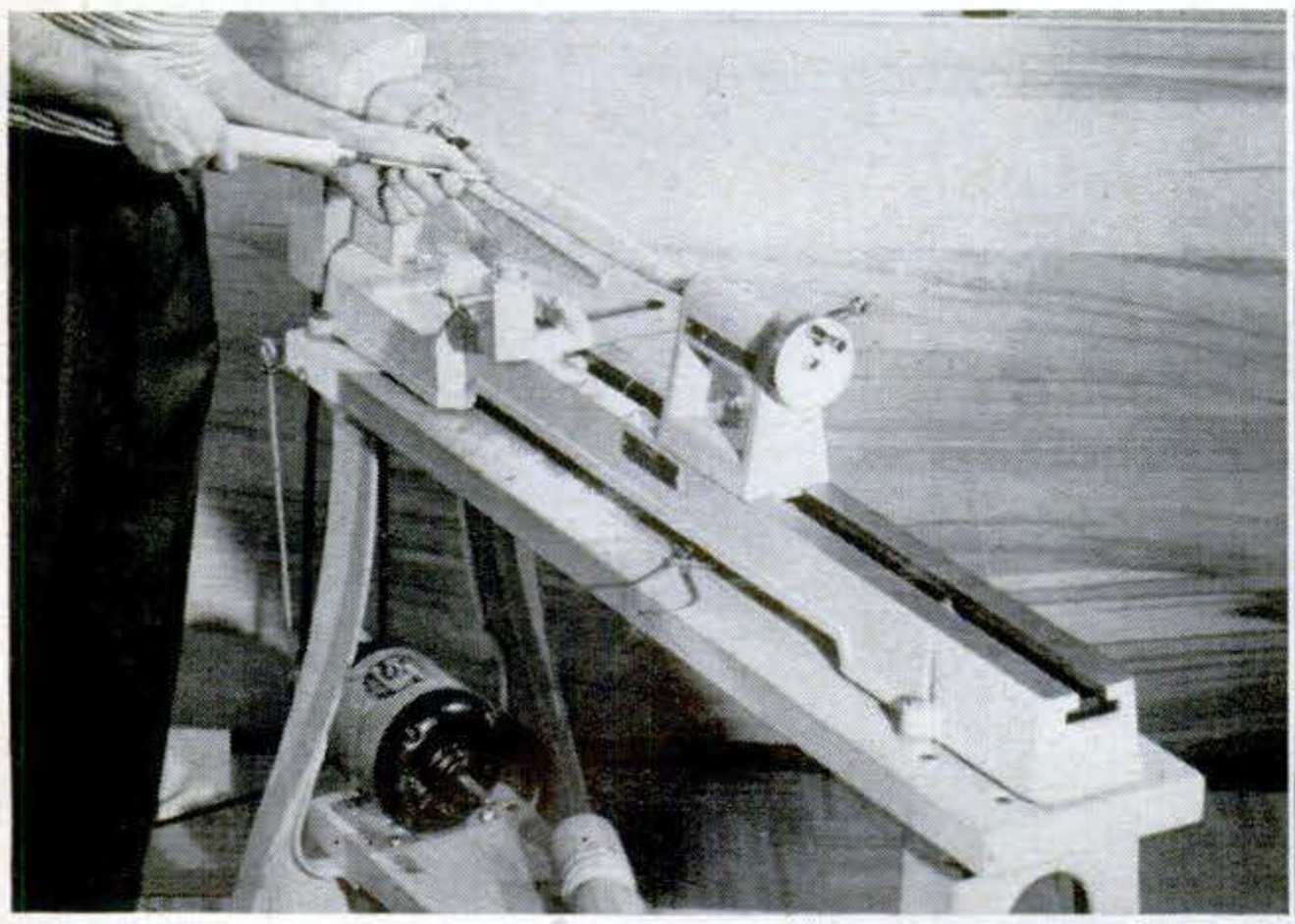


DELTA'S BANDSAW cuts stock up to 6" thick, and blade is 10" out from frame. The table tilts 45°, has a graduated scale. An abrasive belt can be installed in place of the blade to convert saw to a contour sander. A sliding guard covers all of the blade except the part that's cutting. A light illuminates the cut. Price: about $65.

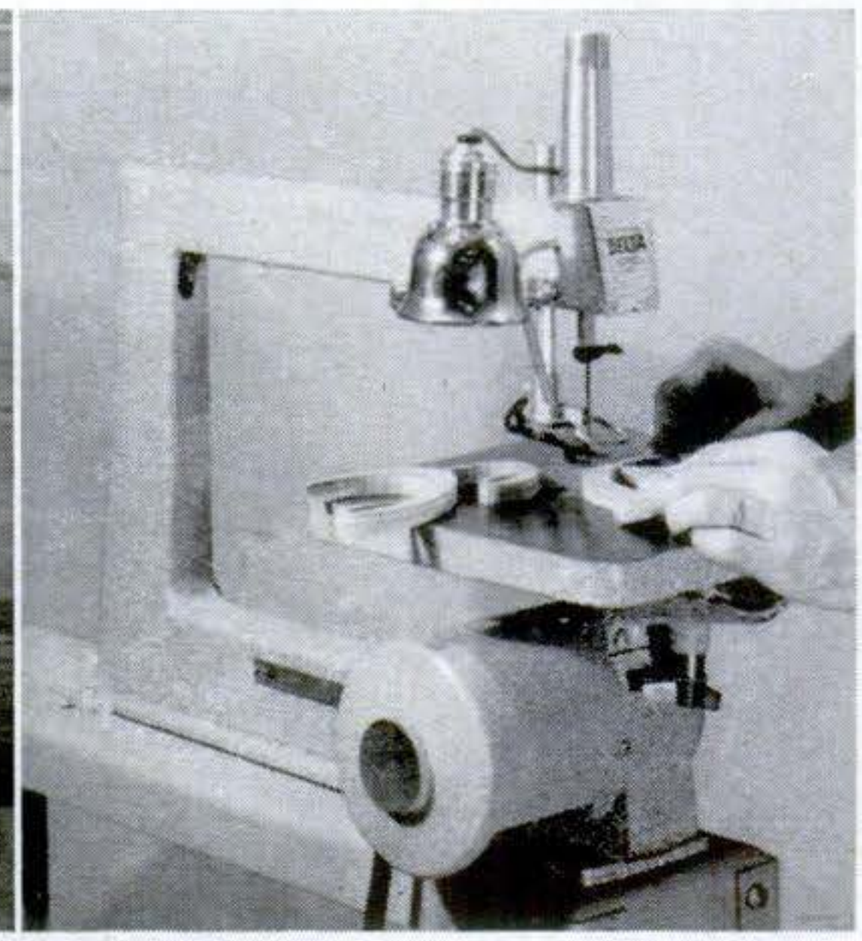


DRILL PRESS has four speeds, and pulleys are dynamically balanced to prevent vibration. Tool can be used separately or with a special base that fits the Deltashop—Delta's combination. Tool shown, about $70.

DELTA *engineers feel that people want tools that look as slick as modern home appliances. Four restyled Delta power tools are seen on this page*



THIS WOOD-TURNING LATHE is said to have the largest capacity ever built into a home-shop model. It will turn large pieces such as bowls up to 14" in diameter over a deep gap in the bed. Work 36" long and 11" in diameter can be turned over the bed itself. The headstock has a device for indexing. Price: about $80.



SCROLL SAW cuts internal and external curves in wood up to 2" thick, or light metal. A blower clears sawdust from the cutting line. Lower blade-chuck takes sanding sleeves and machine files for fine finishing. About $50.

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New Router Has Economy Price Tag

A NEW router brings good news to economy-minded woodworkers—its $39.95 price tag. Made by the Millers Falls Co., Greenfield, Mass., the router is at least 10 dollars cheaper than any on the market, yet it has the capacity and power to handle just about any routing job.

For $39.95 you get the basic tool, consisting of the 30,000-r.p.m. power unit, chuck, two wrenches and the router base. You buy the router bits, selecting them according to your needs from a wide assortment. To extend the router's usefulness, you can add the following attachments as you need them:

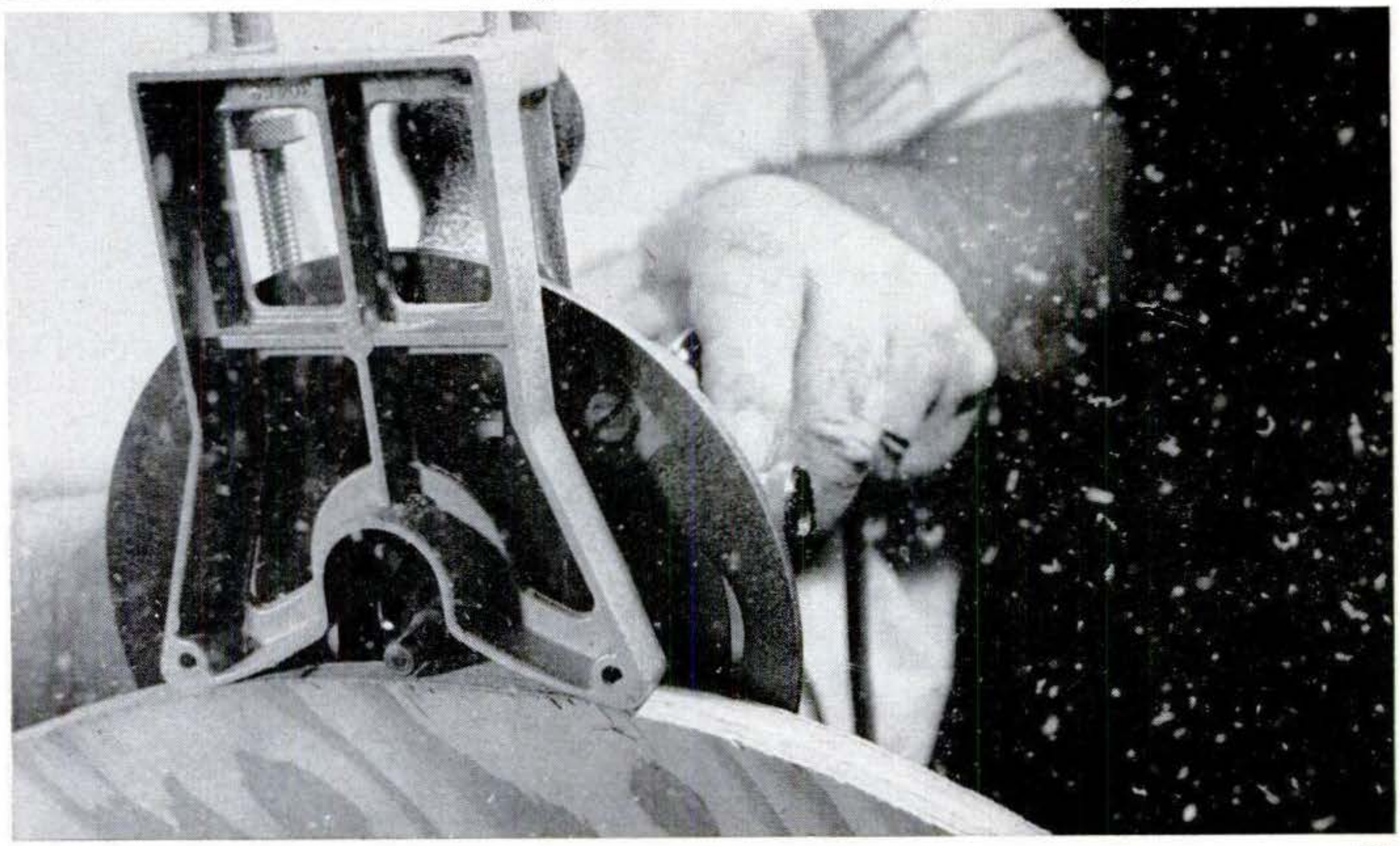
A clip-on scale priced at 75¢ divides each full turn of the helically grooved power unit into 64ths of an inch for fine depth-of-cut adjustments.

A routing guide at $3.25 is used for grooving or for shaping along straight or circular edges. A knurled adjusting nut provides micrometer adjustment.

A trammel point at $2.50 can be used to

ROUTING WITH A TEMPLATE makes the duplicating of intricate inlay grooves an easy job. Template guides are interchangeable with those of other router manufacturers.

An underside view shows how the guide follows a curved edge for making decorative cuts.



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The plane attachment has a long 14″ shoe, planes to 45° bevel. Adjustments are calibrated.

swing the router for cutting circular grooves.

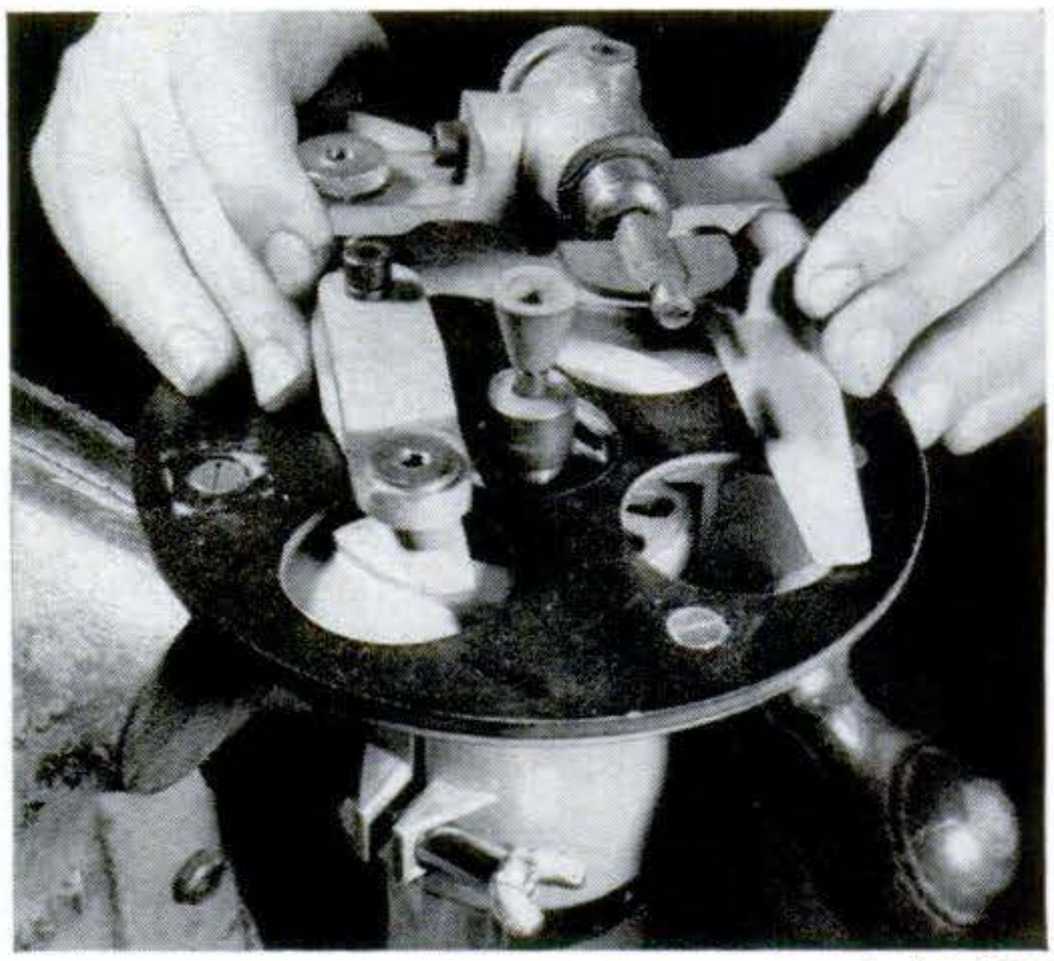
An edge-trimmer guide at $2.95 permits "off-hand" bevel cuts on edges.

Template guides in four sizes at $2.25 each are used with the router to follow patterns for duplicate or intricate work.

Fabricators of counter tops and laminate-covered furniture will find that a special laminate trimmer base ($12.50) and carbide-tipped trimming bit ($8.95) put the tool in the professional class.

For $31.95 you can add a complete plane attachment set to the power unit for fast, effortless planing—up to 1/8″ in a single pass. It features an outboard arbor support and a helical cutter to eliminate chatter.

A large shaper table of 1″ marine plywood can be added for $19.95.



ROUTER SHARPENS ITS OWN CUTTERS: A $14.50 jig holds cutters for accurate grinding with a cup grinding wheel. Click stops flip bits one-half turn to sharpen both sides equally.

Light Automatically Adjusts Lens Opening of Movie Camera

ENERGY from the light you photograph by, changes the lens opening on a new 8-mm. movie camera. A photocell converts the light to electrical energy, which activates a rotating-coil voltmeter. No batteries are needed.

A gear attached to the meter coil meshes with two iris gears. As the coil moves around a fixed, solid core—in proportion to the energy received—the meter gear turns the other two, changing the lens aperture.

Taking movies with the fixed-focus, single-speed Bell & Howell is simple: Point it and press the shutter lever. If the sun sneaks behind a cloud, the opening changes automatically. A black spot appears in the viewfinder if the light gets too dim. The control works only with color film (ASA 10 or 16) but you can over-ride it manually for faster films.

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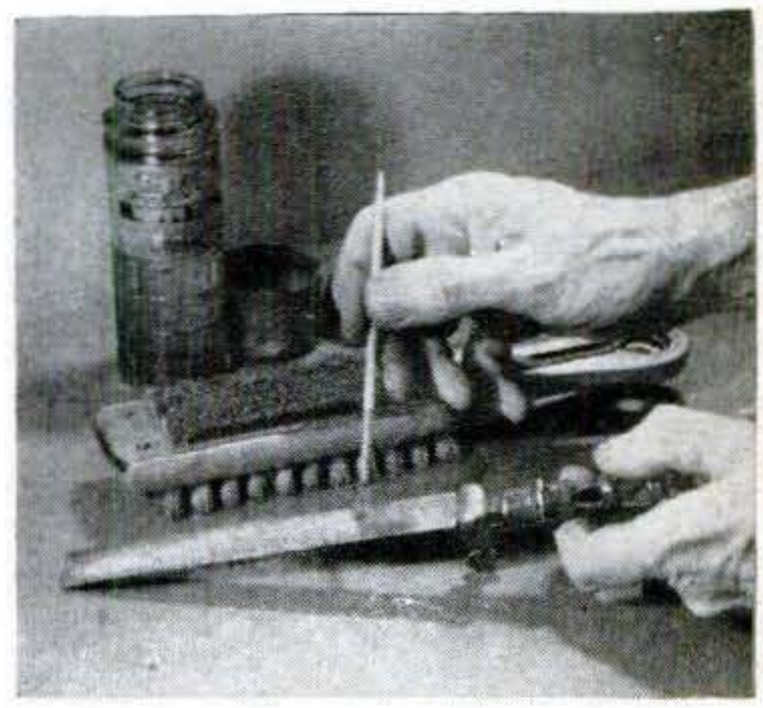
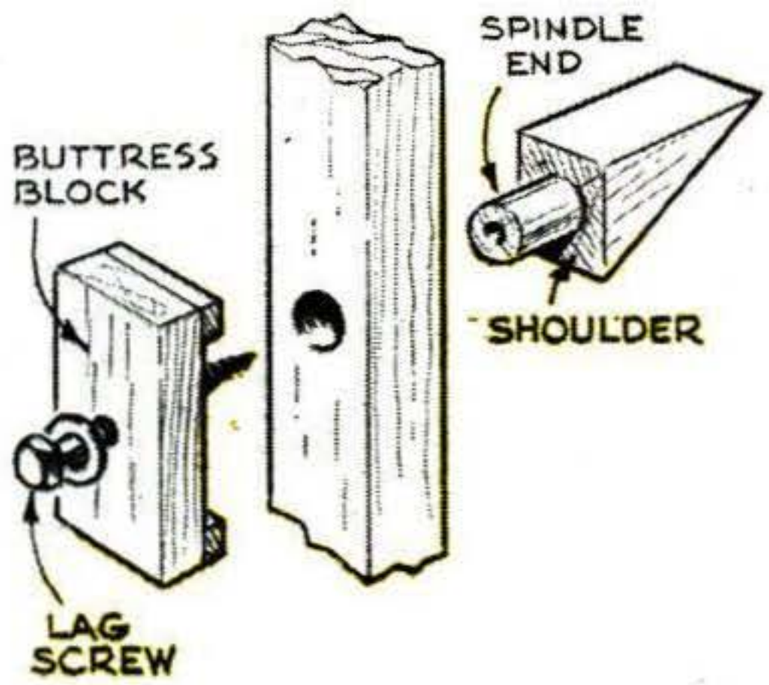
The POPULAR SCIENCE Shop Notebook

Use dry-cleaning fluid to renovate a wood rasp when its teeth become so solidly filled with a mixture of pitch and wood particles that ordinary methods won't work. Apply the fluid with a paint brush and let stand a minute or two. Then work out the softened accumulation of residue with a succession of cross strokes of a file card or a wire-bristled brush.—*Walter E. Burton, Akron, Ohio.*

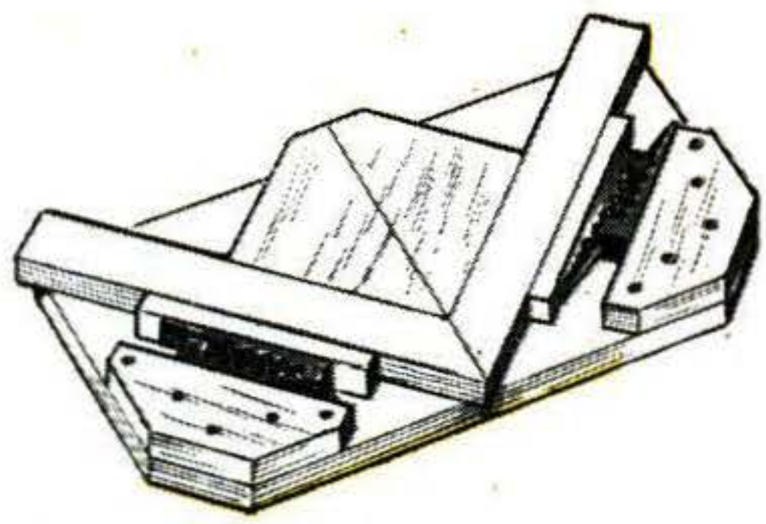


Convenient soldering-iron cleaner is a piece of abrasive cloth tacked to one corner of a workbench. Wipe the tip of the hot iron across the abrasive occasionally while you are soldering. This will help keep the hot surface free of scale, and smoothly tinned.—*John A. Comstock, Wellsboro, Pa.*

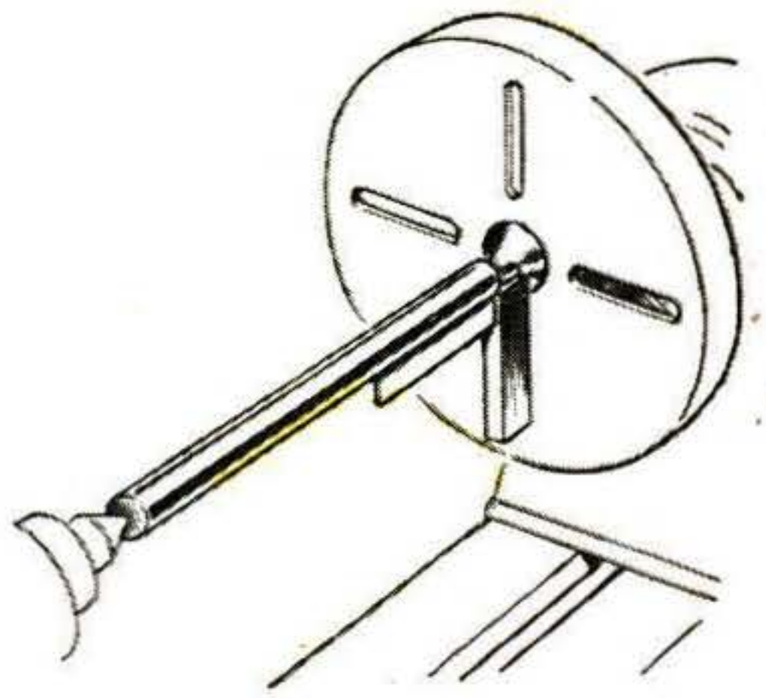
A buttress block and a lag screw will hold hard-to-clamp spindle joints firm until the glue sets. The buttress block should have two legs which straddle the joint, to prevent squeezed-out glue from bonding the block to the work. Drill a pilot hole in the spindle-end before arranging the assembly as shown (drawing, right) and driving home the lag screw.—*J. C. Roby, San Diego, Calif.*



Quick-locking miter clamp is easily made from ¾″ plywood and a pair of printer's quoins. These are ramp-shaped metal wedges that are spread apart with a key to lock type in place, and can be bought at printing-supply houses. Four triangular blocks screwed to a square base form the clamping frame. Set the two inside blocks just far enough apart to take a saw blade. To operate, insert the miter pieces between the blocks, back their outside edges with wood pads, and exert pressure with the quoins placed between the pads and the outer blocks. If miter cuts aren't true, re-saw them, with the rear of the saw blade riding in the slot between the inner blocks.—*Harold C. Kimball, Salt Lake City, Utah.*



Here's how to check lathe alignment and square accuracy with one test. Place the lathe's faceplate on the spindle, and mount an 8″ rod between the centers. Take a full truing cut and measure the rod's diameter at both ends. If the rod is *larger* at the tailstock, the tailstock is off centerline toward the *back* of the lathe. If it is *smaller* at the tailstock, it is off center toward the *front*. Adjust the tailstock until you get a cut that produces no taper. Then test your square by holding its body against the faceplate, which must be clean and smooth. If light shows between the blade and the rod, the tool is out of square.—*J. Randolph Lucas, Roanoke, Va.*



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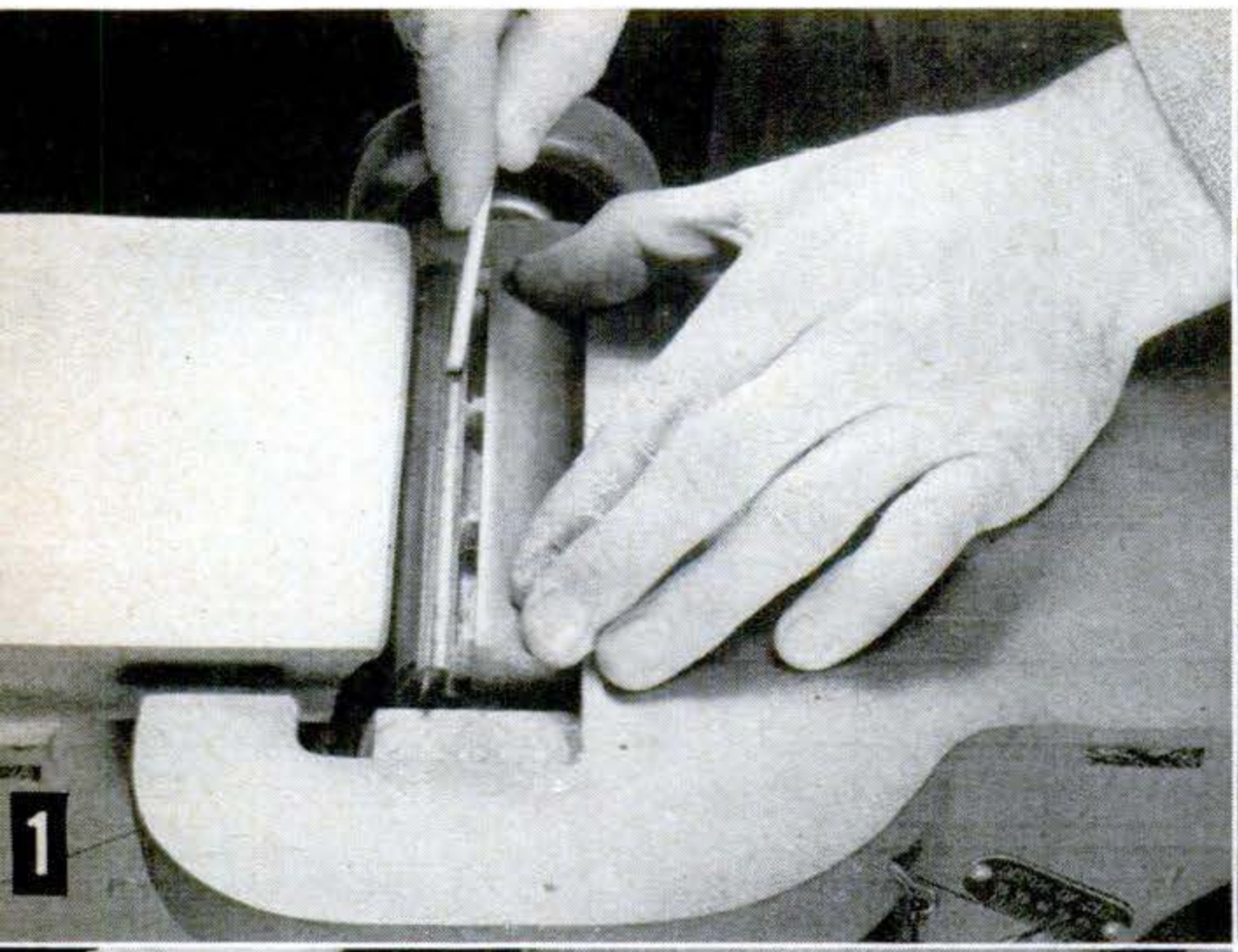

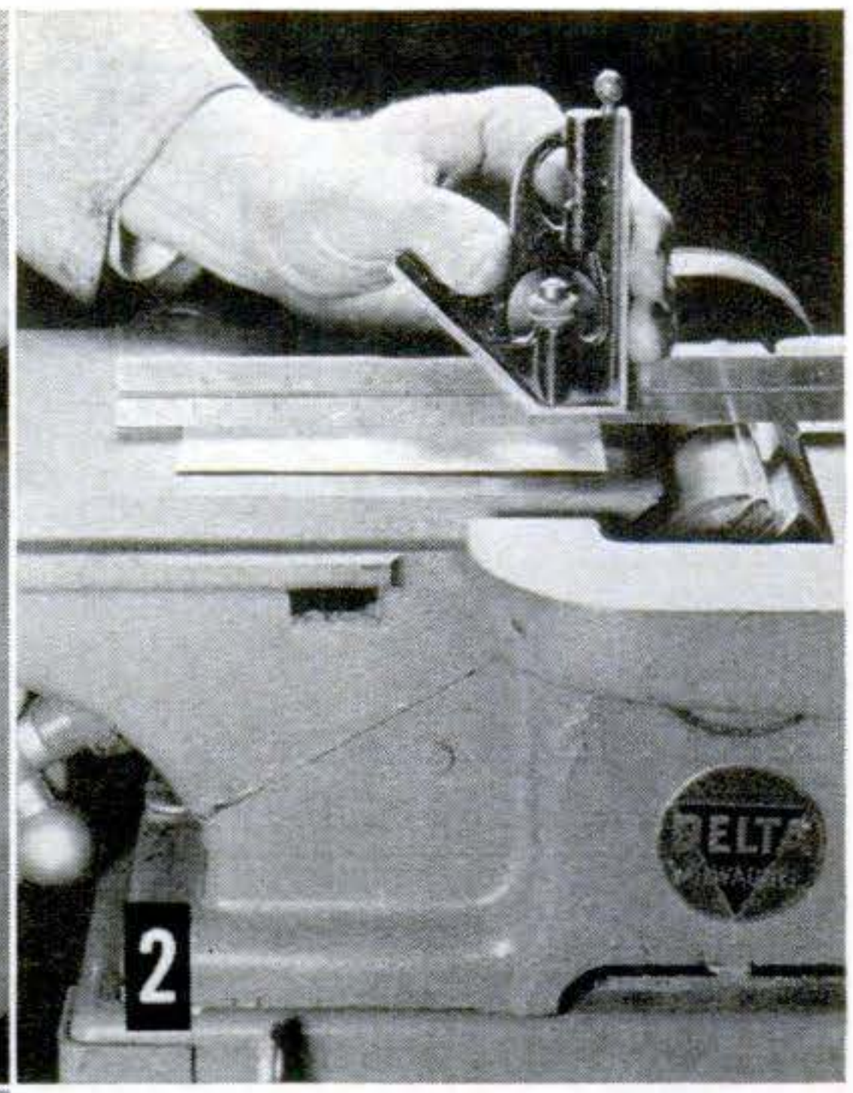

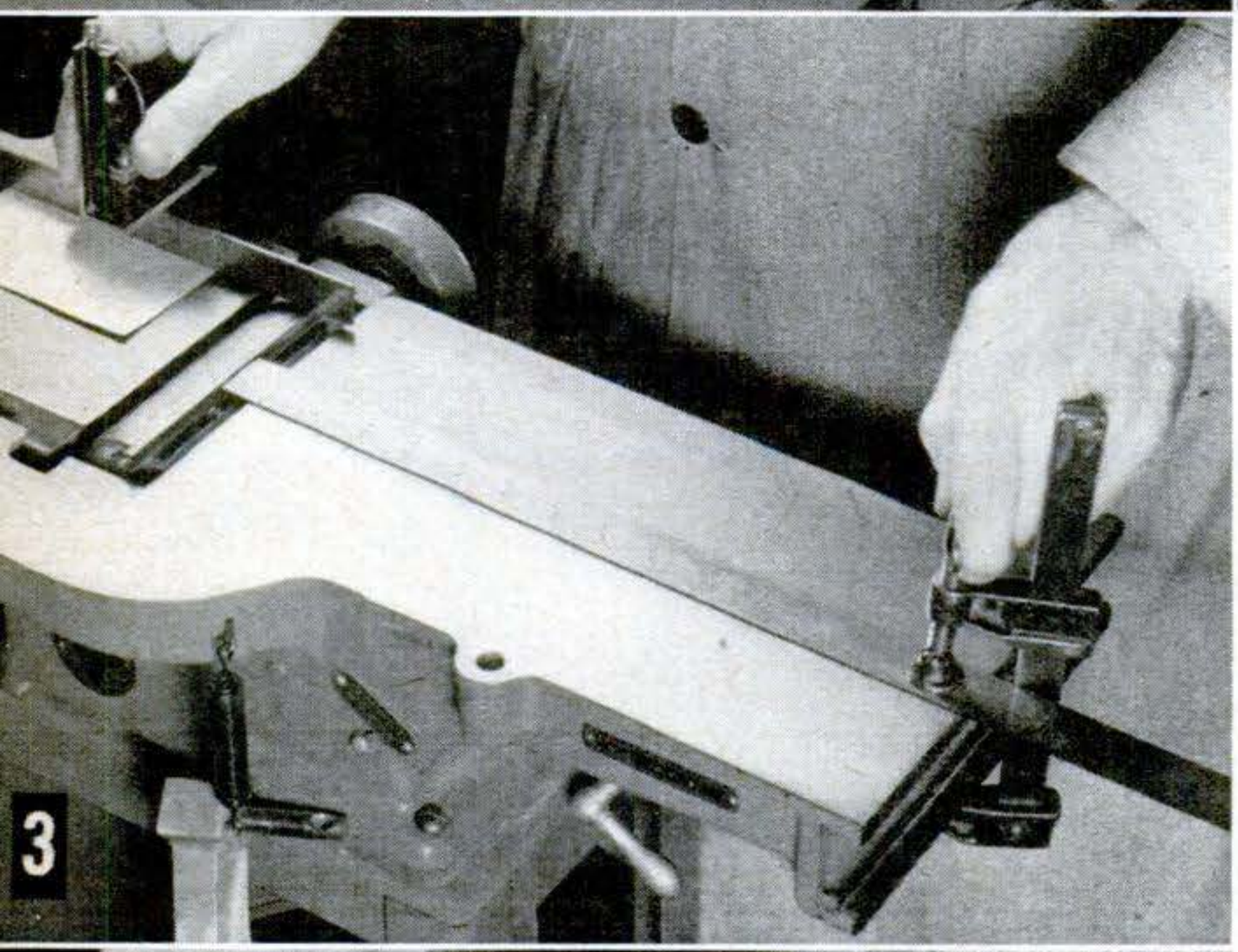

Sharpen a jointer this way: First, disconnect the power supply (don't rely on the switch; play safe and *pull the plug*). Remove the guard and fence. With a 1/4″ dowel, clean out any pitch and dirt that may be embedded in the knife lock bar ahead of the blades, as in (1). Using a steel rule with a thin piece of cardboard under it as a gauge, turn the cutterhead and lower the rear table until the rule just lies on the flats of the beveled blade edges—see (2). With the gauge still in place, clamp another steel rule to the front table so that it locks the cutterhead in this location when the free end of the rule is flush with the table. This way it will act as a ratchet, springing up each time the cutterhead is backed to the next blade, as in (3). Wrap another strip of cardboard of the same thickness as the one used for the gauge around one end of a fine carborundum stone, to protect the rear table. Apply a few drops of oil and hone each blade, stroking straight across it, as shown in the photograph (4).—*Glenn A. Wagner, Delmar, N. Y.*

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First Aid for Your Car Horn

If it honks when it shouldn't, doesn't when it should, or just sounds sour, here are the fixes

By Phil McCafferty

Police in a Midwest city are still looking for a motorist who, irked by a blaring horn behind him, halted his car in the middle of five-o'clock traffic recently. Walking back, he calmly lifted the hood of the car behind and ripped out the horn wiring. Slamming down the hood, he told the surprised young lady behind the wheel:

"There! I fixed that horn. It won't honk now!"

Then he returned to his own car and disappeared in the traffic.

RIPPING out the wiring is a legitimate and logical fix if you're ever caught in the embarrassing situation where your horn won't stop blowing. In actual practice, however, you'd do better to loosen the hot wire from the relay terminal.

There are other points, too, that it'll pay you to know about the horn system of your car.

Because horns draw "juice" and quite a bit of it, pressing your horn button only supplies a ground to the winding of a horn relay coil. The relay contacts, closed by the energized coil, supply the horns with current. This clever gimmick makes the wire to the horn button carry only the comparatively small amount of current required to operate the relay.

(This year's Plymouth and Dodge cars are different, however. Arcing at the contacts is much less

"I COULD TELL YOU how to fix this horn, Pop, but I think it'll be more educational if you do it yourself."

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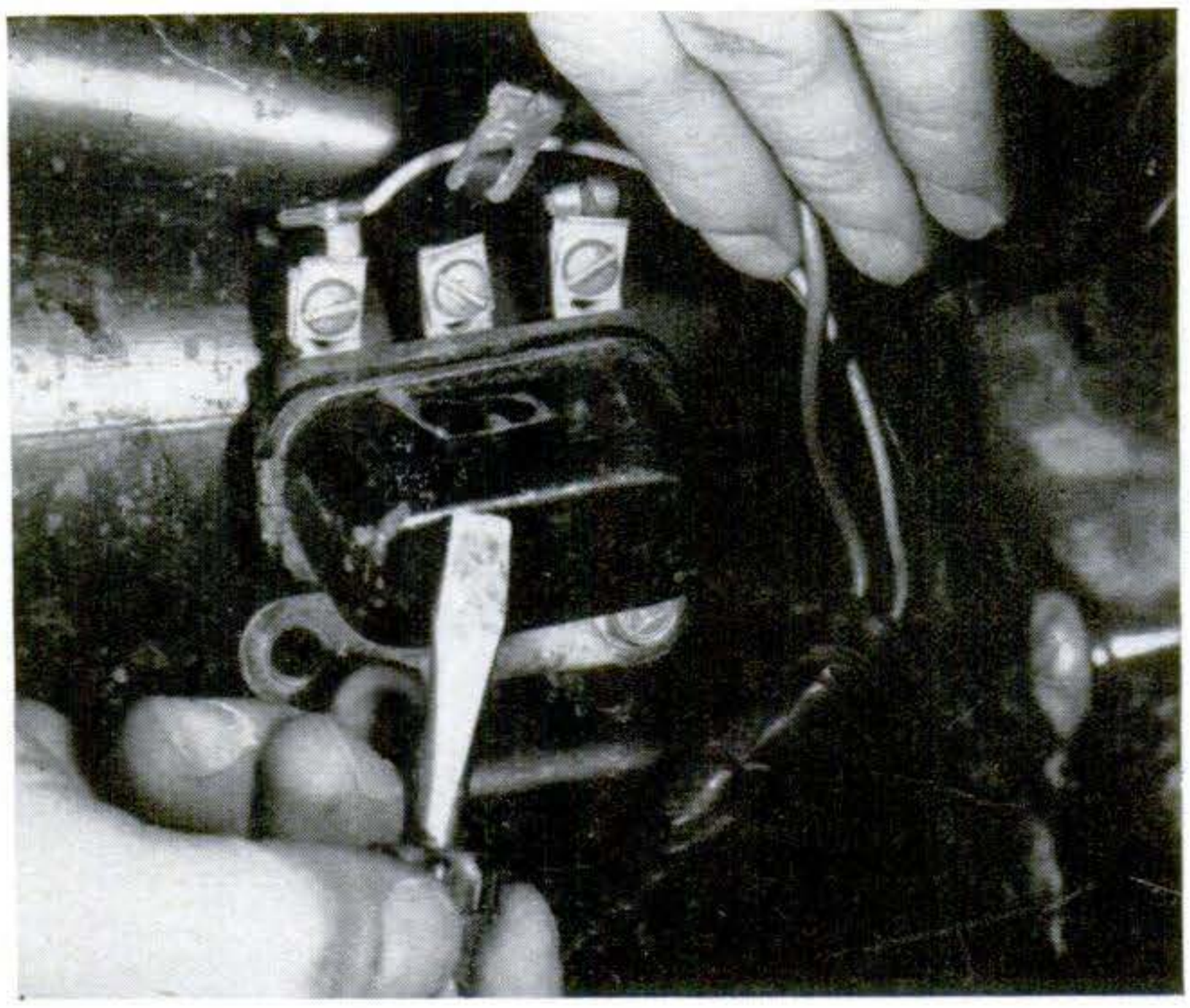
What to do when a horn sticks



1 QUICKEST WAY TO SILENCE IT is to remove the hot wire from the relay terminal. This is usually the center terminal, sometimes marked "B." The wire is often colored red.

OR

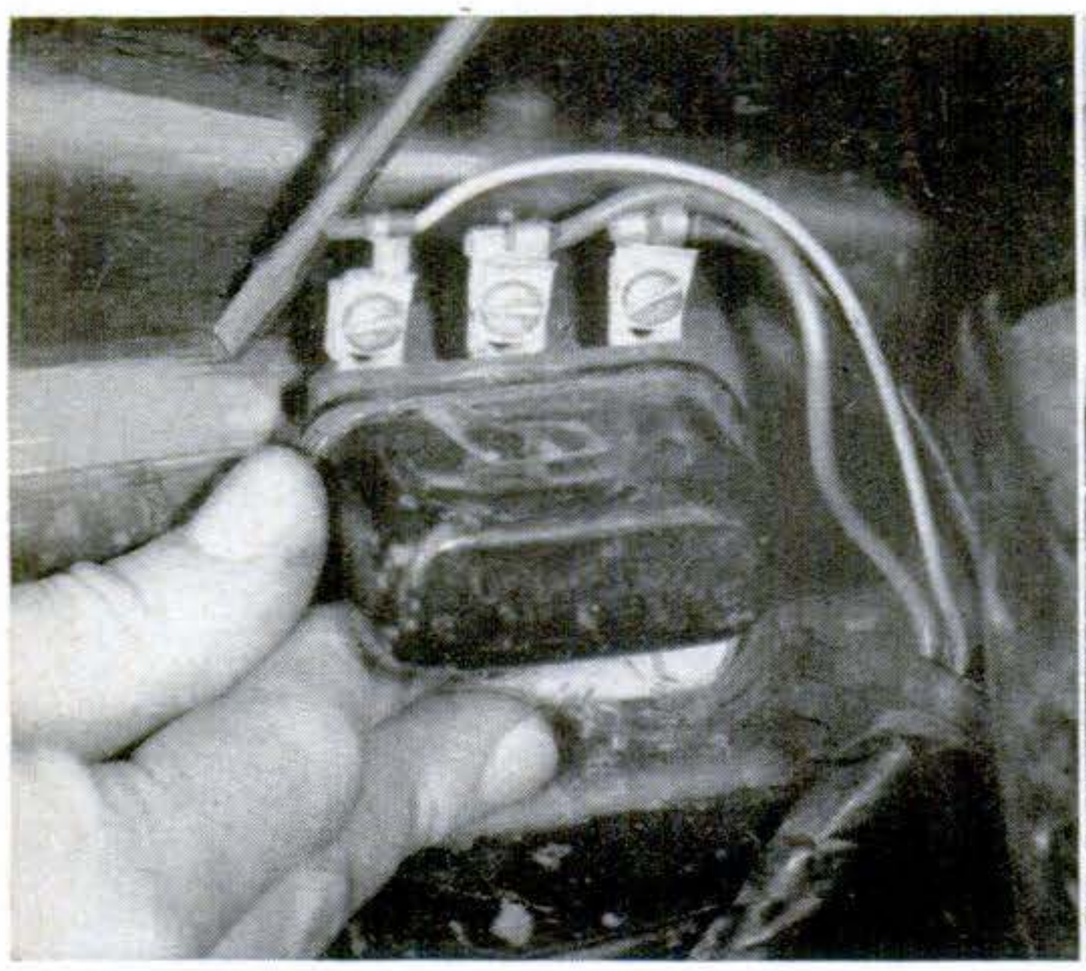
2 RAPPING THE RELAY CASE with a screwdriver handle may free the contacts of a stuck relay. On some '57 models, the wires have plug-in connectors that can be yanked loose.

in 12-volt electrical systems and is not considered a problem, so the '57 models have no horn relay. The horn ring does the job and a heavier wire completes the circuit from ring to horn.)

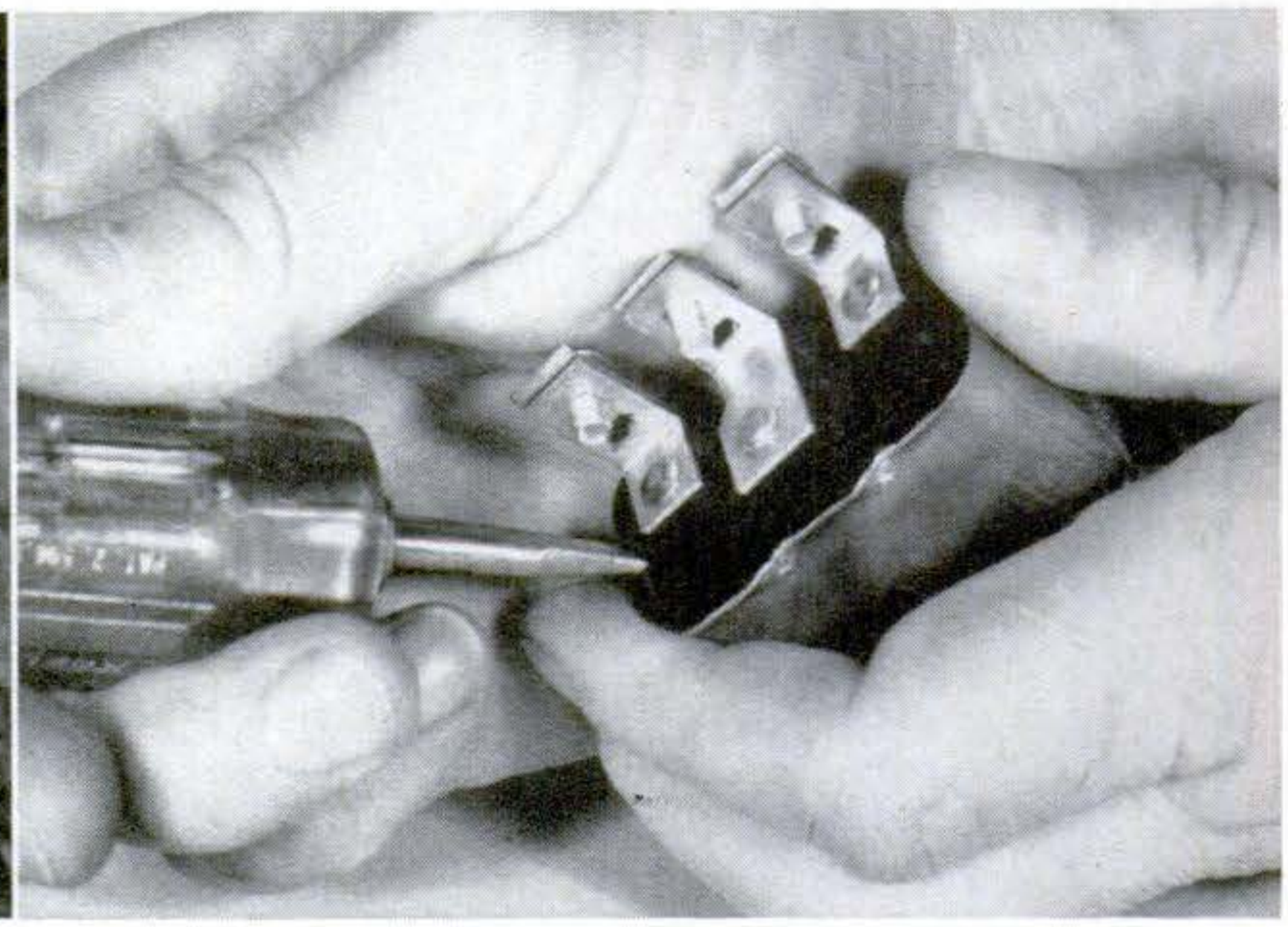
If a horn won't stop honking when you release the button, chances are the relay contacts are stuck in the closed position. A sharp rap may help open them.

If your horn honks unexpectedly, the wire is probably grounded somewhere between the horn button and relay. On many cars this wire goes through a hollow steering tube up to the horn button. If for any reason the wire binds or rubs, the bared wire may ground out. Horns that

Checking and fixing the horn relay



YOU CAN TEST THE RELAY quickly by grounding the "S" terminal—the one connected to the horn button. If the horn blows or you hear a click inside the case, the relay is okay.



PRY OFF THE RELAY COVER and check the condition of the contacts. Burned or pitted contacts sometimes stick when closed, or limit the current flowing to the horn.

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How a typical horn system works

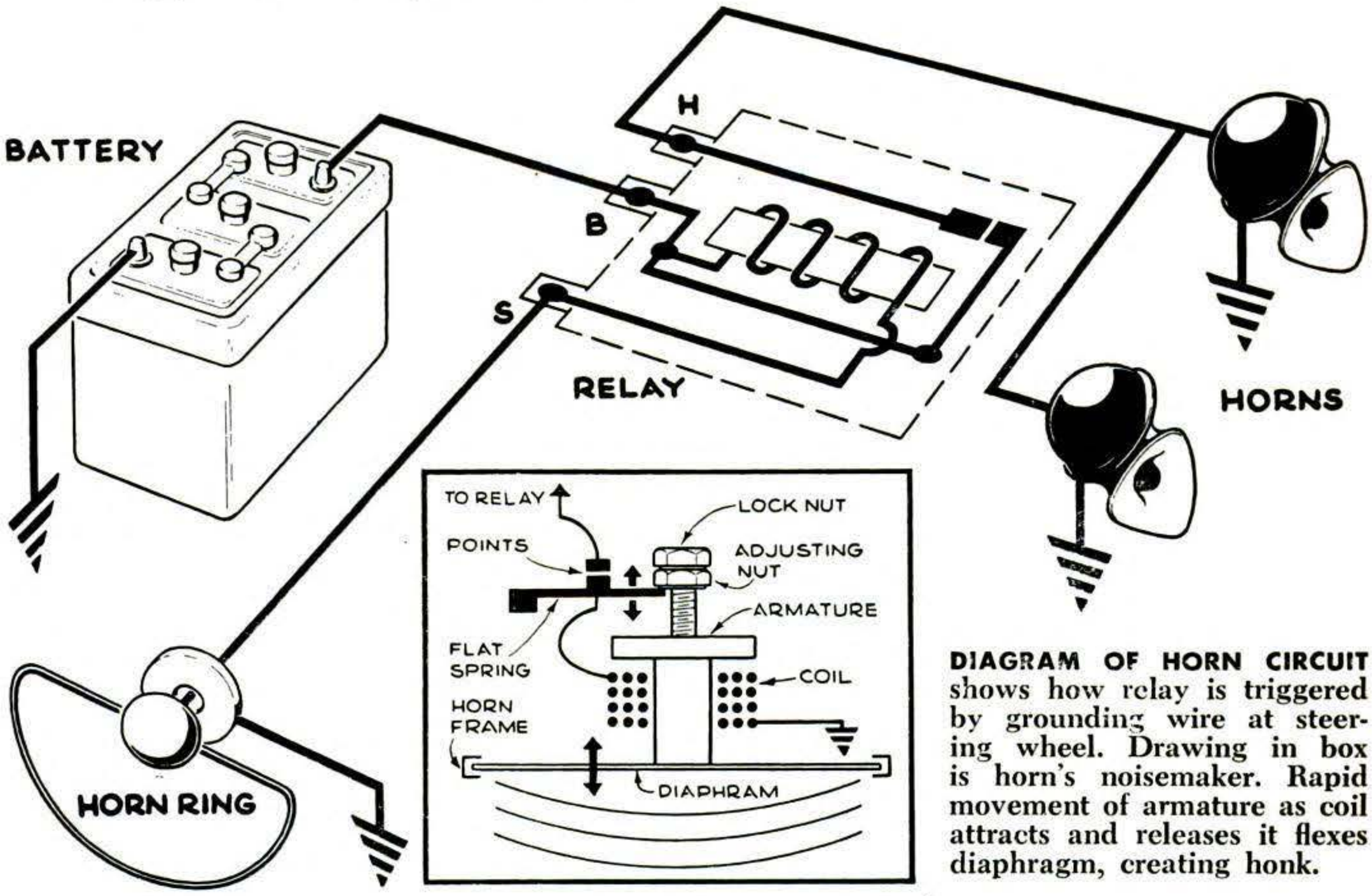


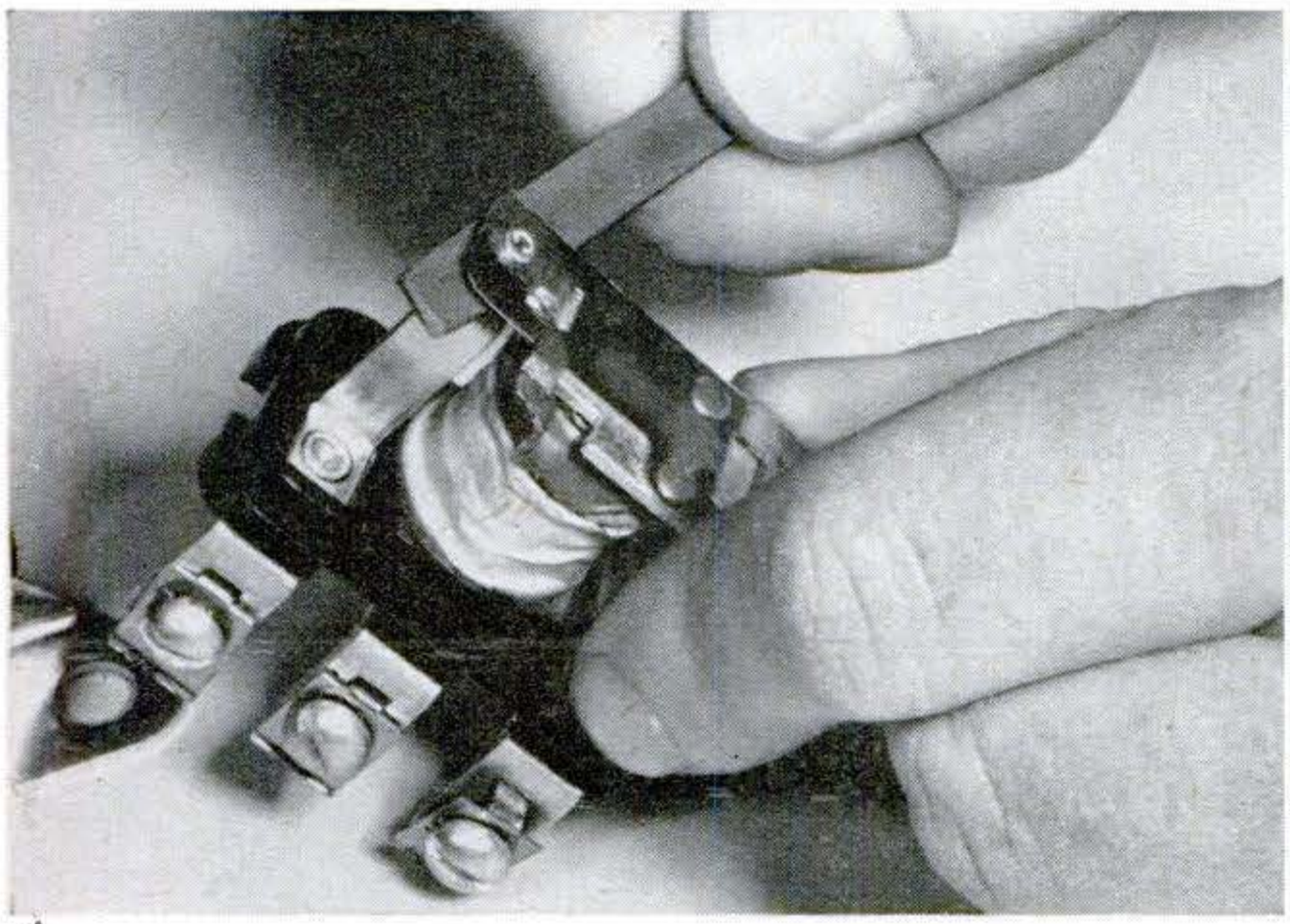
DIAGRAM OF HORN CIRCUIT shows how relay is triggered by grounding wire at steering wheel. Drawing in box is horn's noisemaker. Rapid movement of armature as coil attracts and releases it flexes diaphragm, creating honk.

blow when the steering wheel is turned are prime examples.

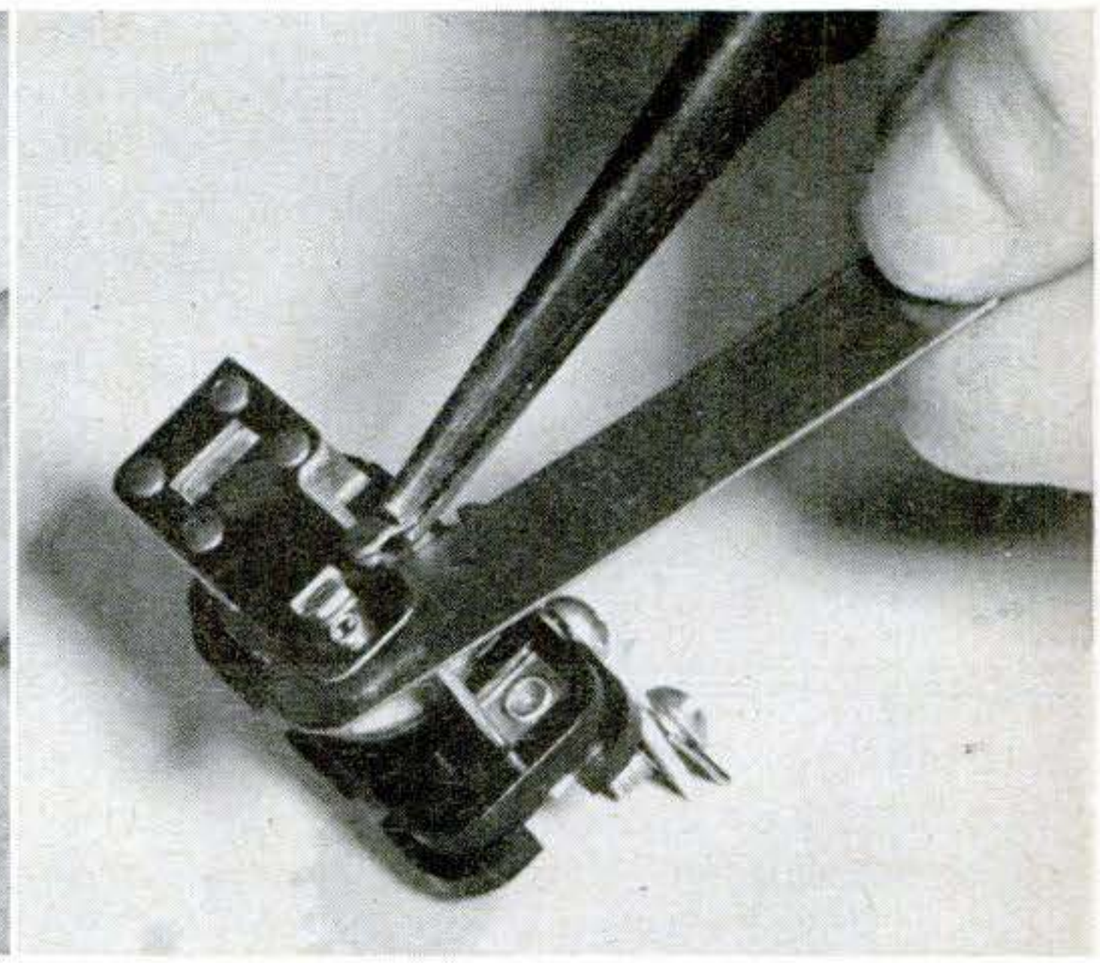
You can spot the hollow steering-tube setup by looking for the horn-blowing wire that comes out the front end of the steering gearbox.

In the other system, the wire from the relay is loomed into the turning-signal wiring harness that enters the steering-shaft housing under the dash. Fortunately, since replacement is a major undertaking, this portion of the wiring seldom gives trouble.

On this system, the wire ends at a circular ring beneath the steering wheel. A short spring-loaded wire turns with the



FILE THE CONTACTS clean and smooth with a distributor-point file. In most cases it will be necessary to open the gap slightly in order to get the file between the contacts.



BEND THE SPACING ARM to hold the gap at about 1/32" open after filing the contacts. Press the cover in place and seal the edges with ignition lacquer or nail polish.

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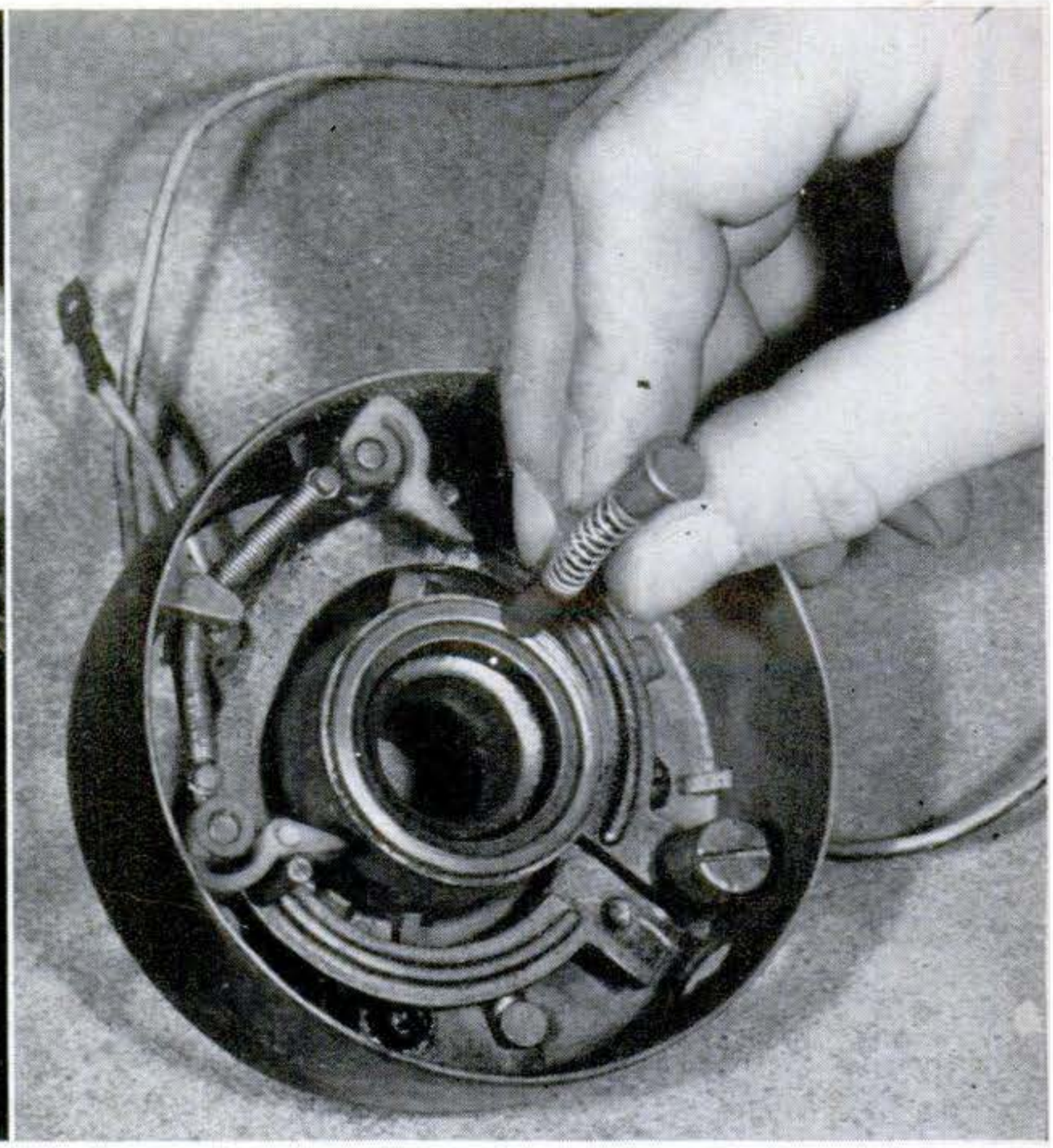
TO GET AT THE HORN-BUTTON CONTACTS, the horn ring must be removed (see text). Prying off the ornamental cap gains entry to the insulated horn ring screws (in hand) above. Removal of these screws frees the horn ring, exposing the contacts beneath it.



COLLECTOR RING WITH BRUSH CONTACT is typical where the horn wire enters the steering column at the dash instead of running *through* it. This system seldom gives wire trouble because the wire remains stationary and doesn't twist with each turn of the wheel.

steering wheel to make constant contact.

When it won't honk or gives an intermittent "beep" it is pretty safe to guess that something isn't grounding properly.

Remove the horn button and lay a screwdriver blade across the protruding wire end and the closest ground. If this sounds the horn, look for a dirty button contact or a weak spring failing to hold the wire end in position for contact with the button.

If grounding the wire end failed to sound the horn, suspect the wire itself. Grounding the relay terminal to which the steering-column wire is connected will tell if the wire is okay. If grounding the relay terminal blows the horn the steering-column wire is probably broken.

If you aren't certain how your particular button or horn ring can be removed, try this sequence:

Look for screws on the underside of the steering wheel that hold the piece in place.

No? Then check for a horn-ring cover or ornament that snaps or pries off, exposing screws that hold the ring or a button flange.

No again? Firmly press down upon the button or ring and twist to remove.

The relay is also checked by this test. As the relay terminal is grounded, if the relay only "clicks," the trouble lies between relay and horns. If the relay doesn't click, and there is power from the battery to the relay, probably there is an "open" in the tiny relay-coil winding.

The horns themselves can be checked out by hooking direct to the battery. However, they seldom fail.

Horn sound can be changed by trial-and-error movement of the one or two adjusting nuts—usually found under the cap on top of the horn.

The adjustment is over a narrow range, and while it has some effect on pitch, it has little control over loudness. What you're actually doing when you make adjustments is varying the distance over which the diaphragm can vibrate.

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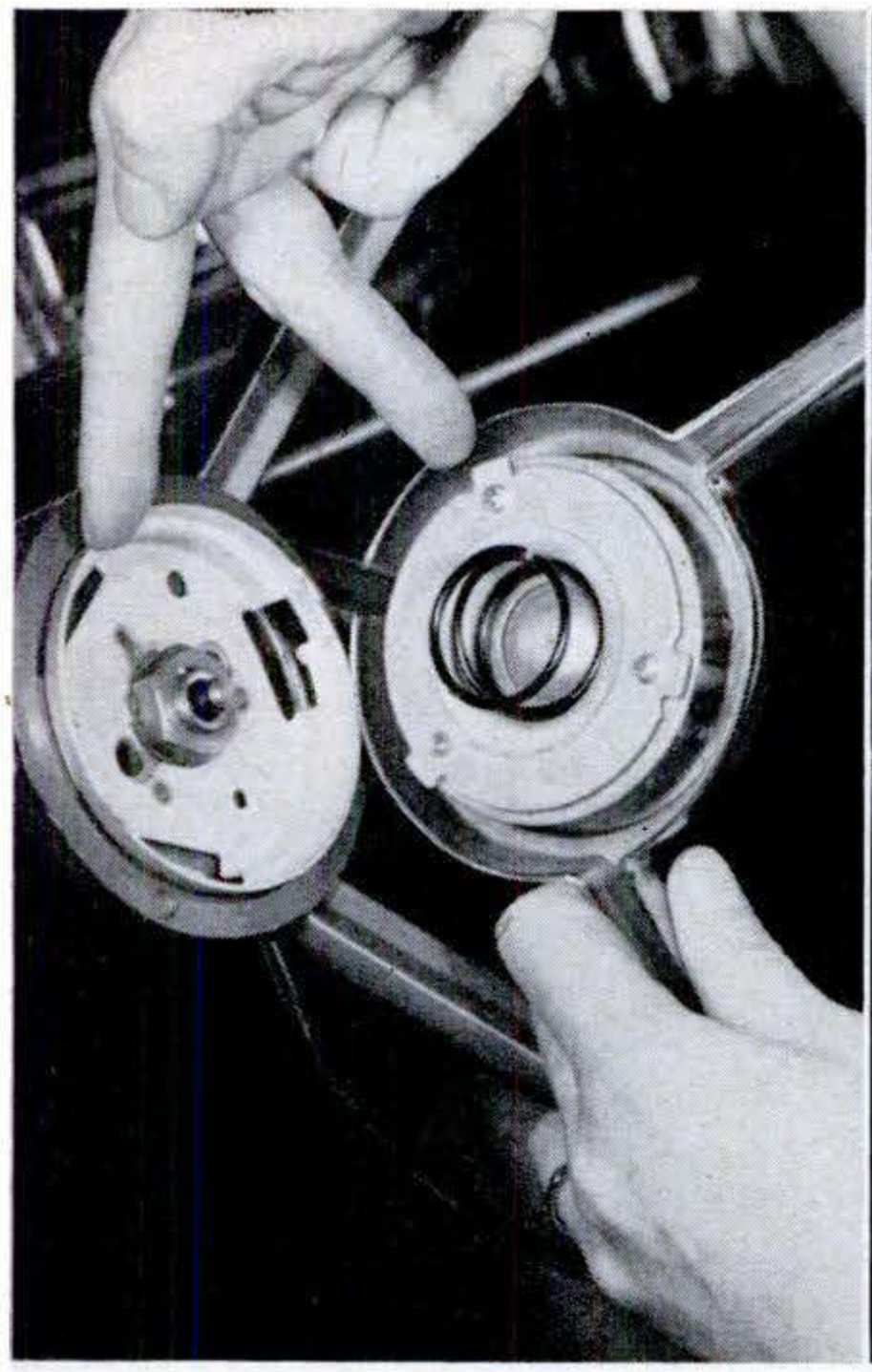
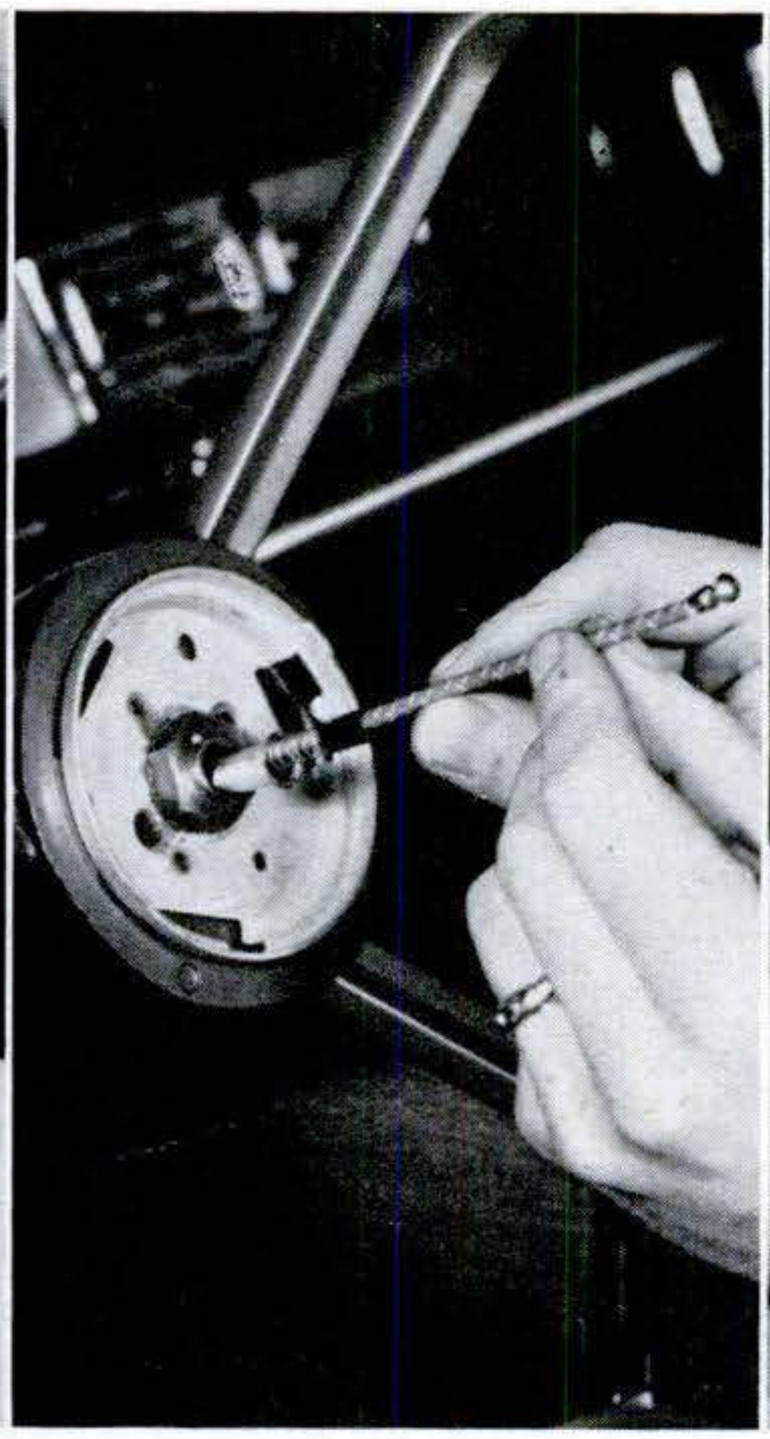
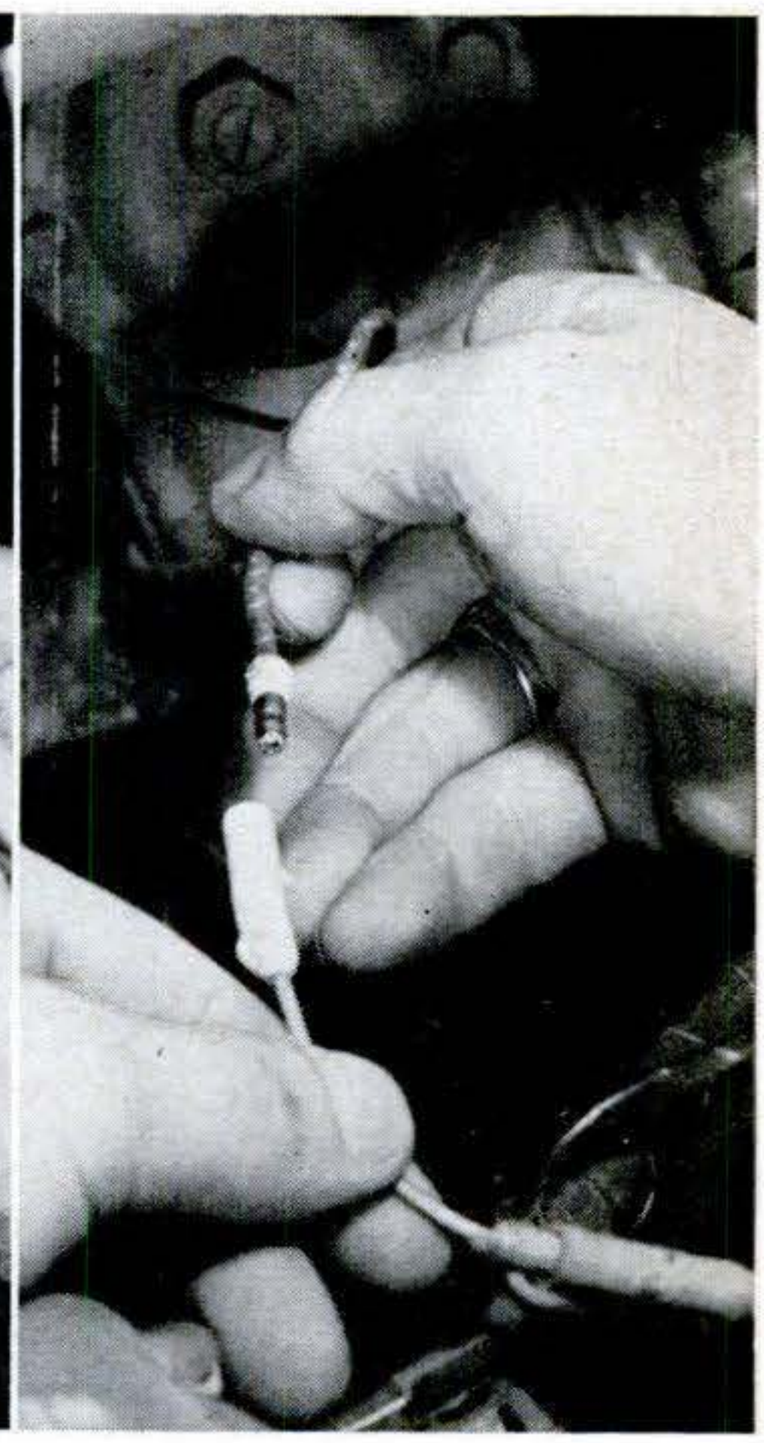


SIMPLER SYSTEM has horn ring held in place by locking lugs. Remove it by pressing ring evenly downward and turning it—usually counterclockwise. A spring will push ring out of hub.

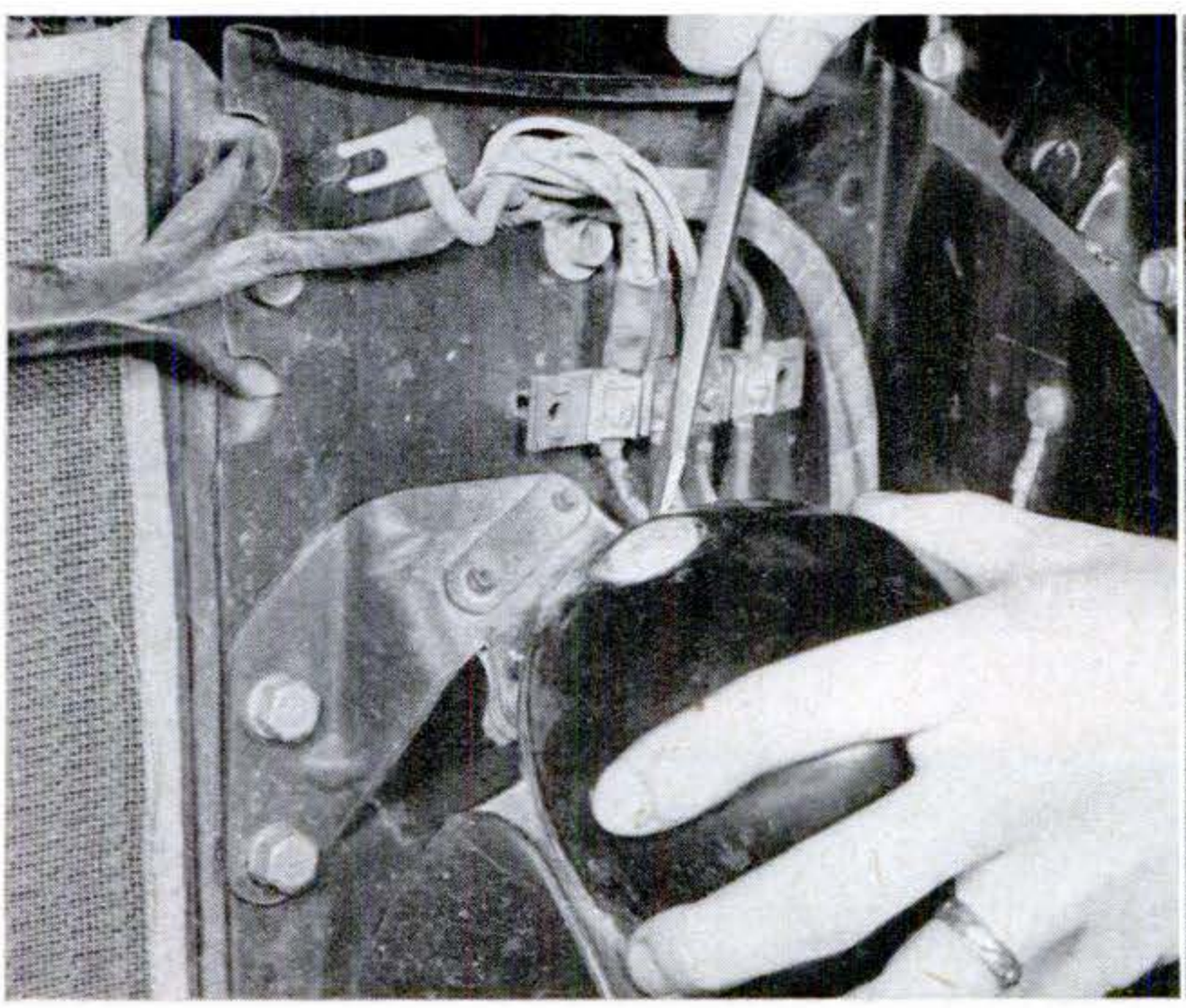


METAL KNOB on the end of this horn wire makes contact with a plate in the horn ring's center when the ring is depressed. You remove a bad wire by pulling it out of the column.

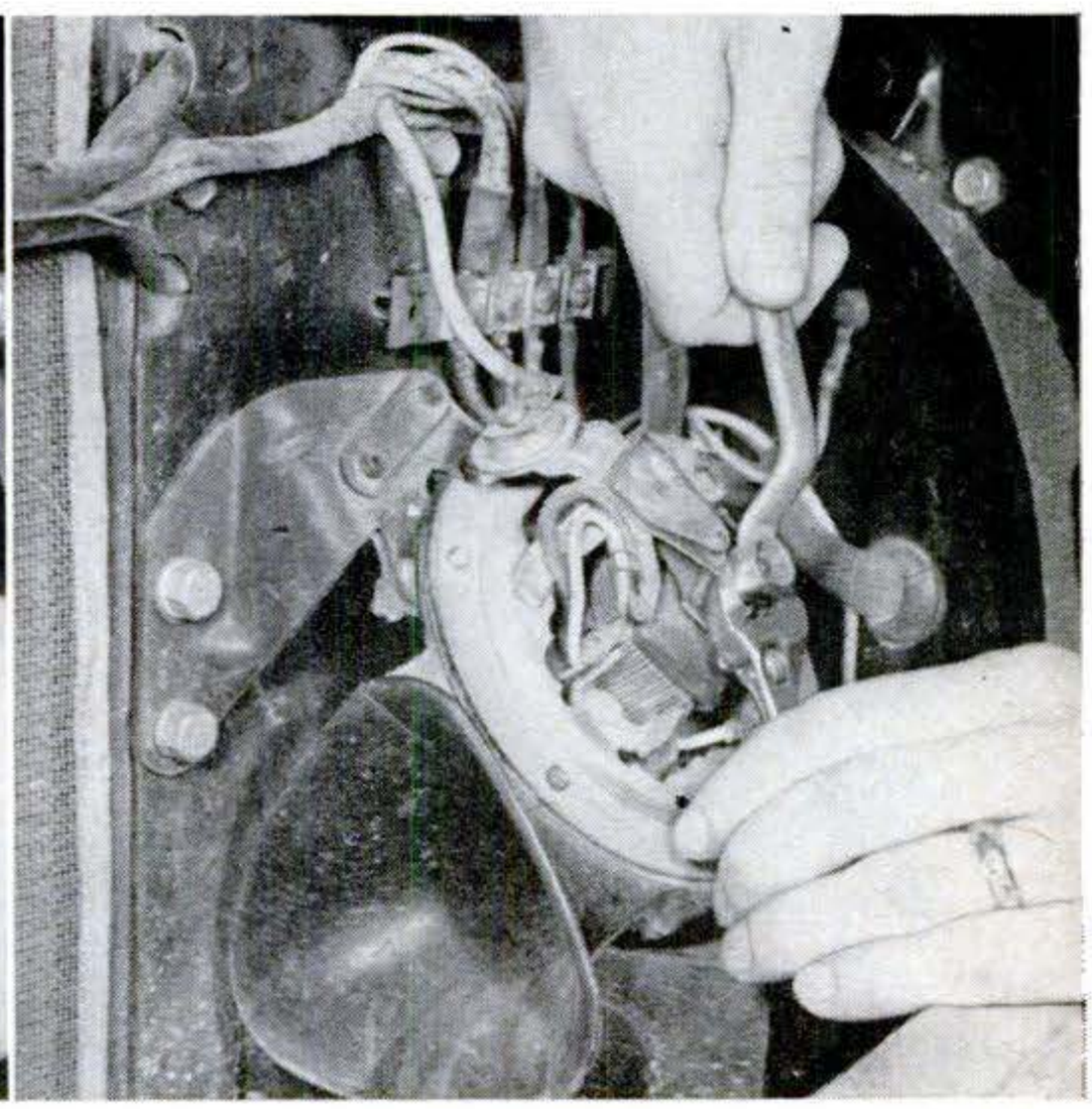


REPLACEMENT WIRE of the right size and length, with correct fittings attached, can be obtained at a car dealer's parts department. The one shown here plugs into wire leading to relay.

How to tune a sour-sounding horn



PRY OFF THE DOME-SHAPED CAP or remove a screw in its center to get at the horn's innards. Tune parallel-connected horns separately, temporarily disconnecting whichever horn you're not working on at the moment.



TURN THE ADJUSTING NUT just about 1/16 of a turn and then try the horn for the sound you want. If there's a locknut, tighten it snugly to keep the adjusting nut from vibrating loose each time the horn is sounded. END

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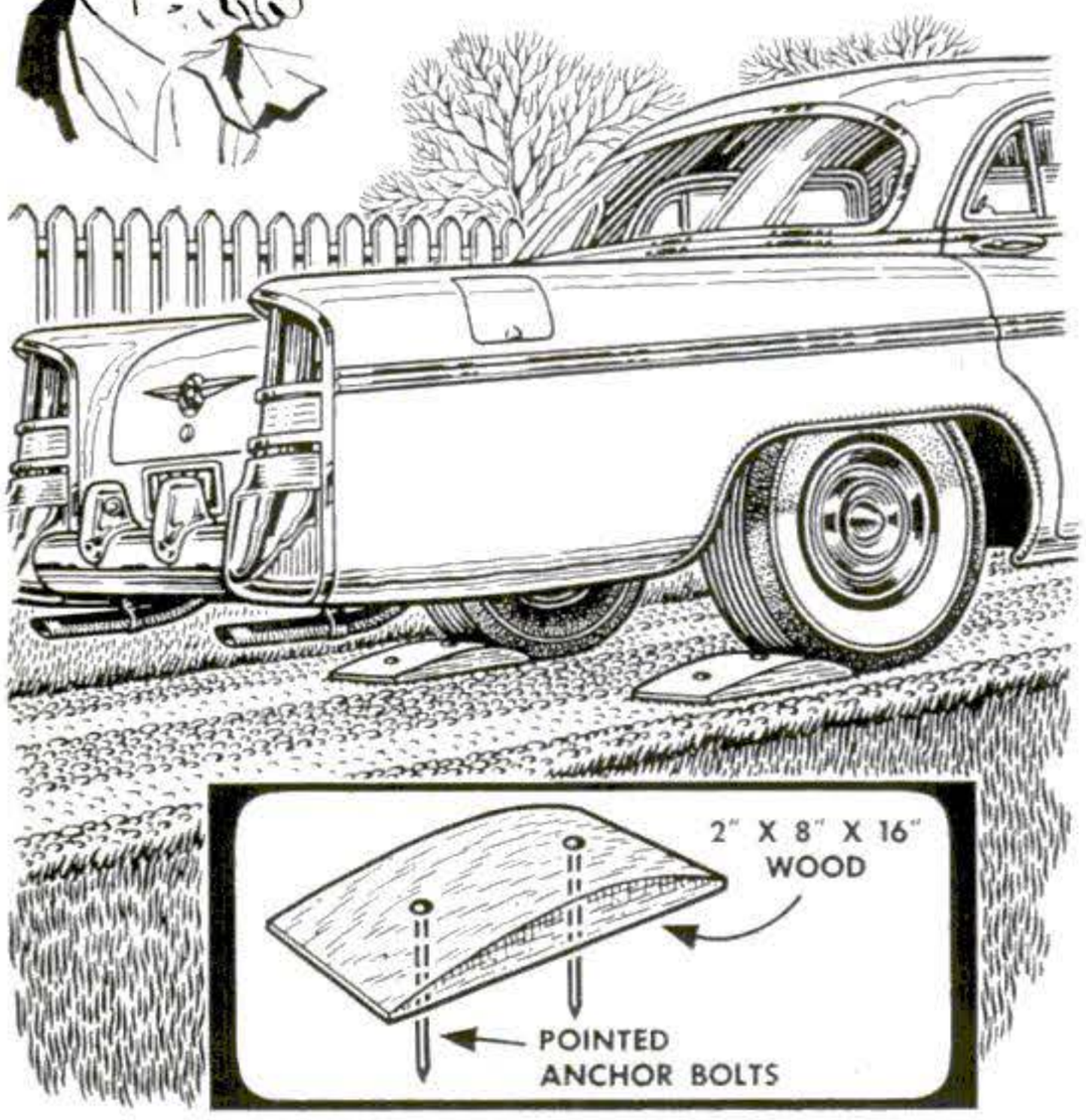
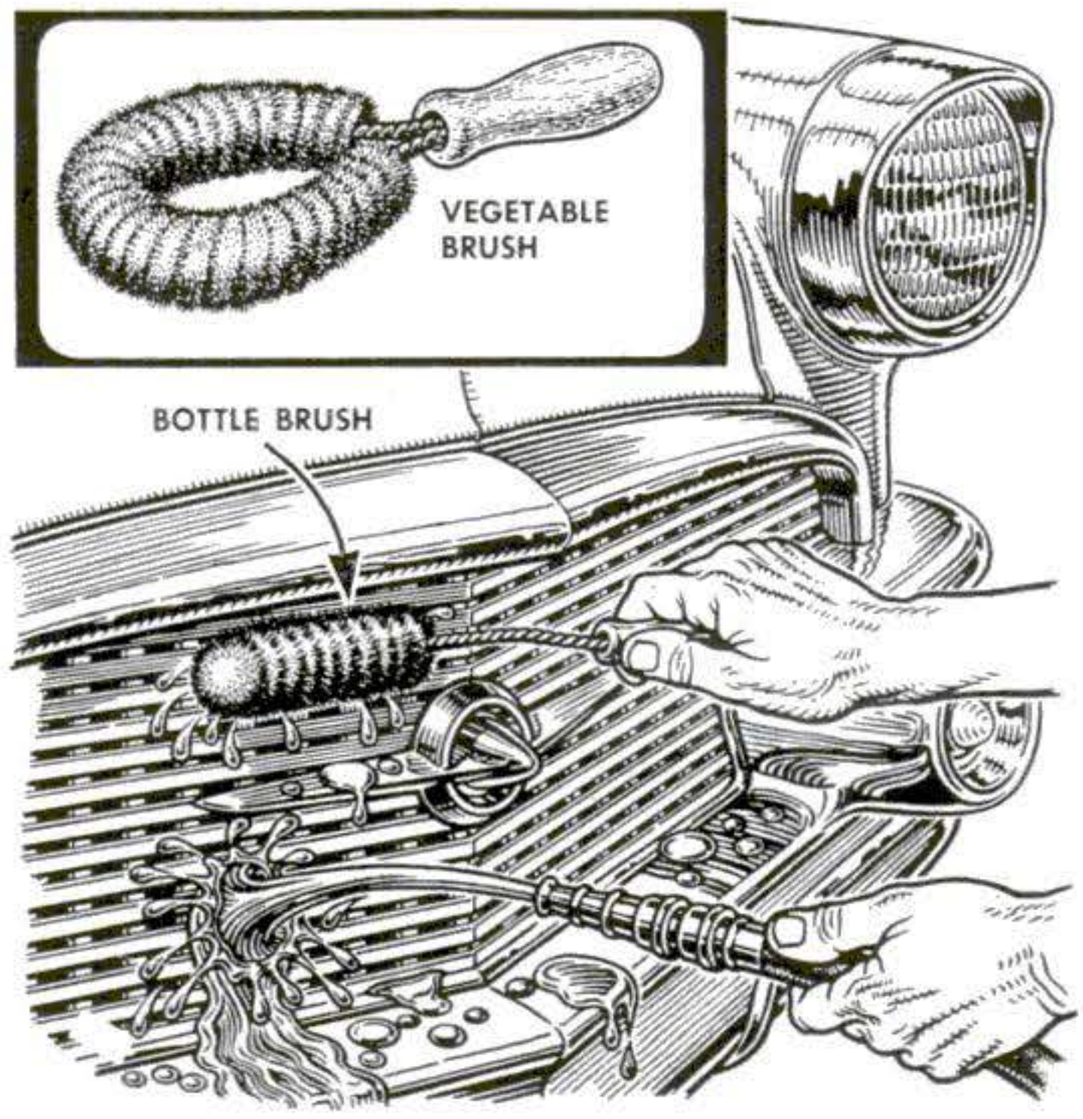
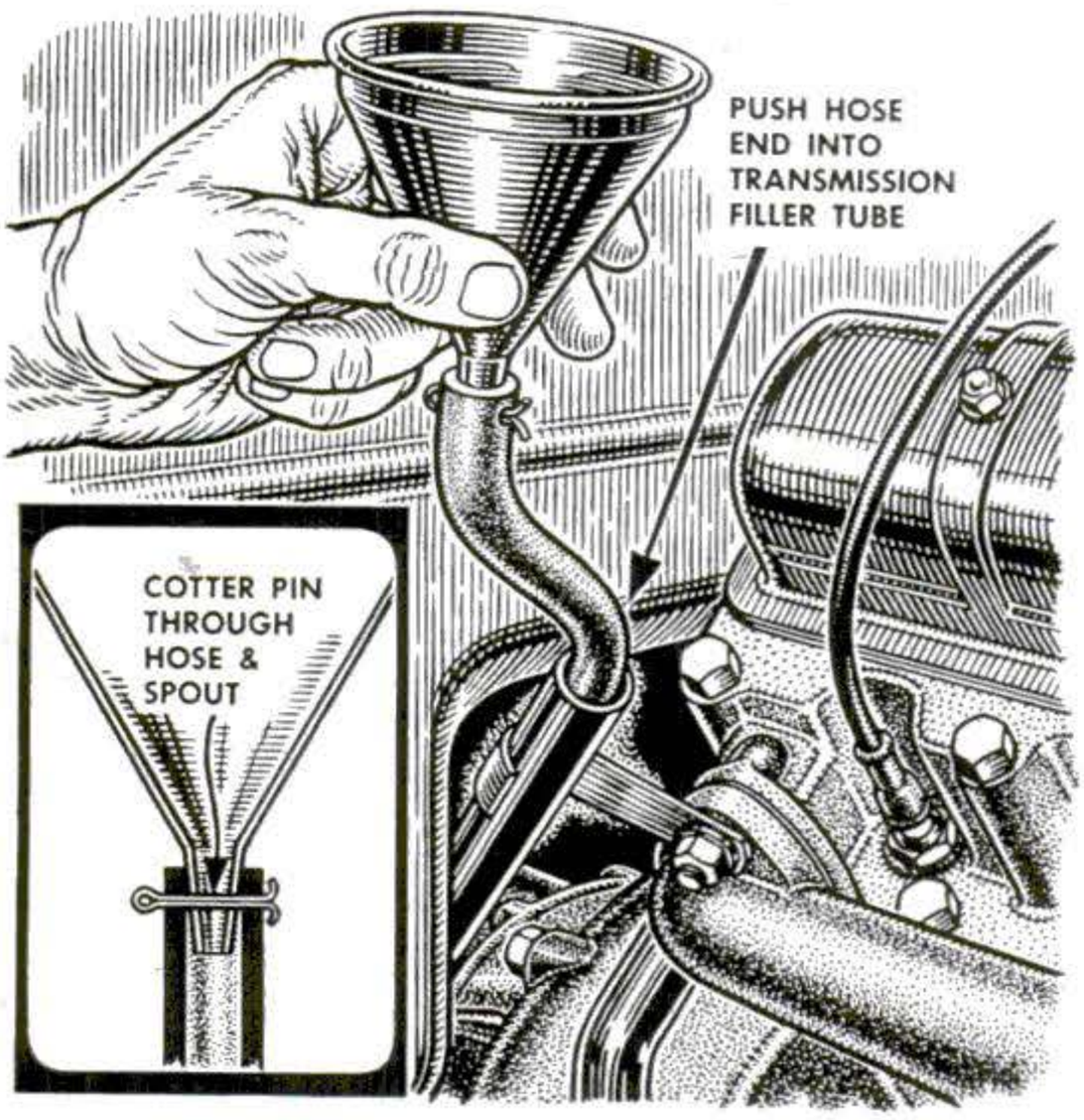
Hints from the Model Garage



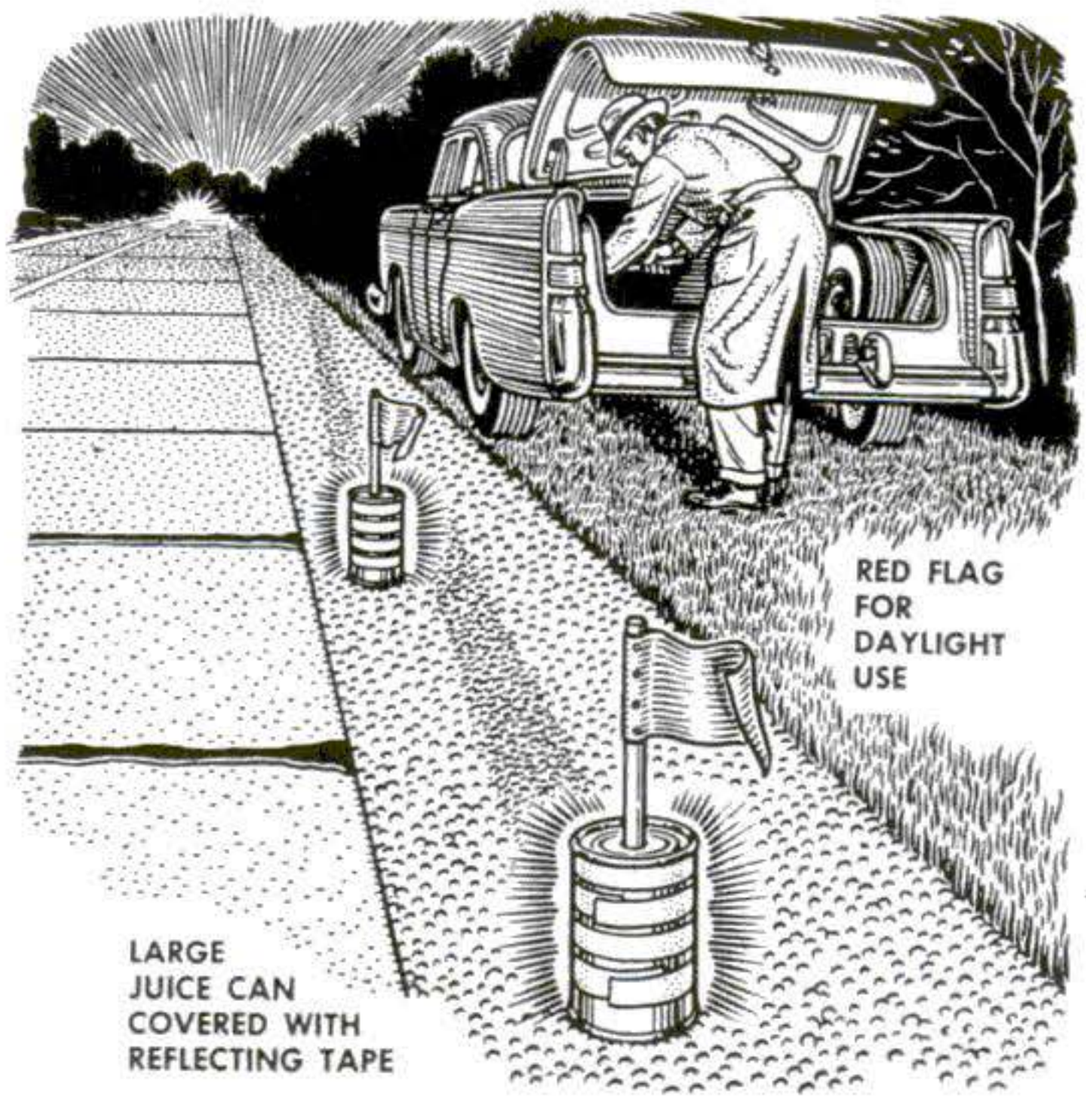
A pair of rounded wood blocks anchored to a sloping driveway will keep a car from rolling away. The blocks should be gently rounded so they are easy to run over, yet at the same time just steep enough to hold the car when it is parked.



Need a handy tool for cleaning the elaborate grille on a modern car? Find a vegetable or bottle brush in the kitchen, and you can reach in and clean *all* the chrome, where a cloth or a sponge would get at and clean only the surface.



A hose attached to a funnel will help get automatic-transmission fluid to a filler tube that is close to the car's firewall. Use hose that will fit *in* the filler tube and slip it over the funnel's neck. A cotter pin will hold the hose in place.



A few tin cans of different diameters make an effective highway warning. Nested, they take little space in the trunk. Wrap with reflecting tape for night, and stow small red flags in the smallest for daylight emergencies.

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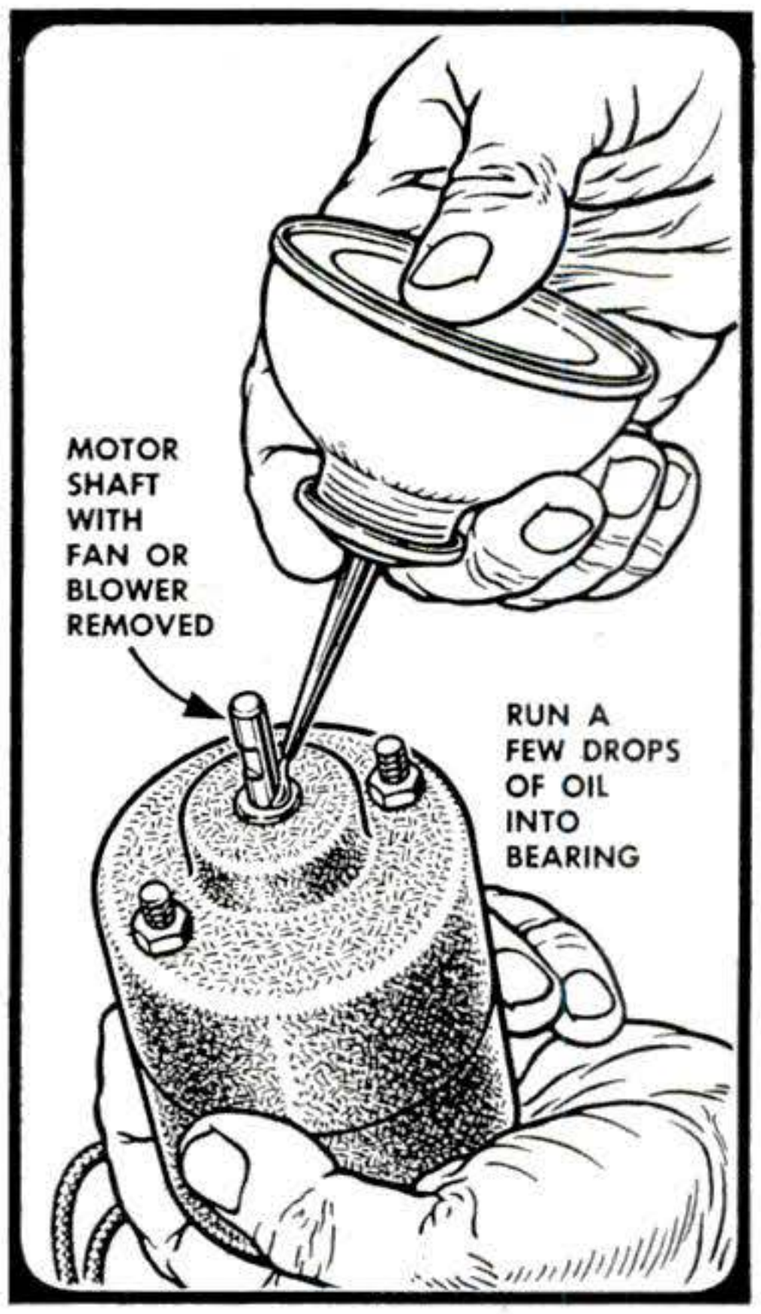
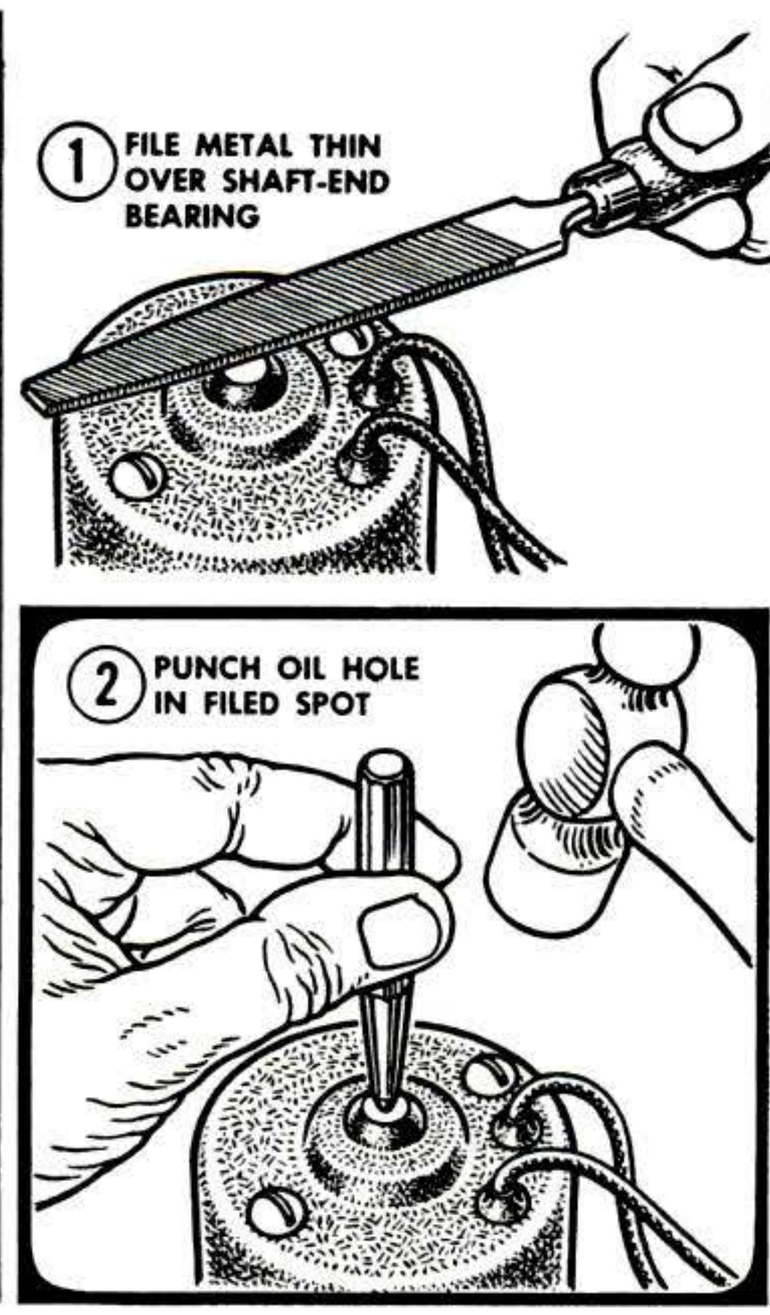
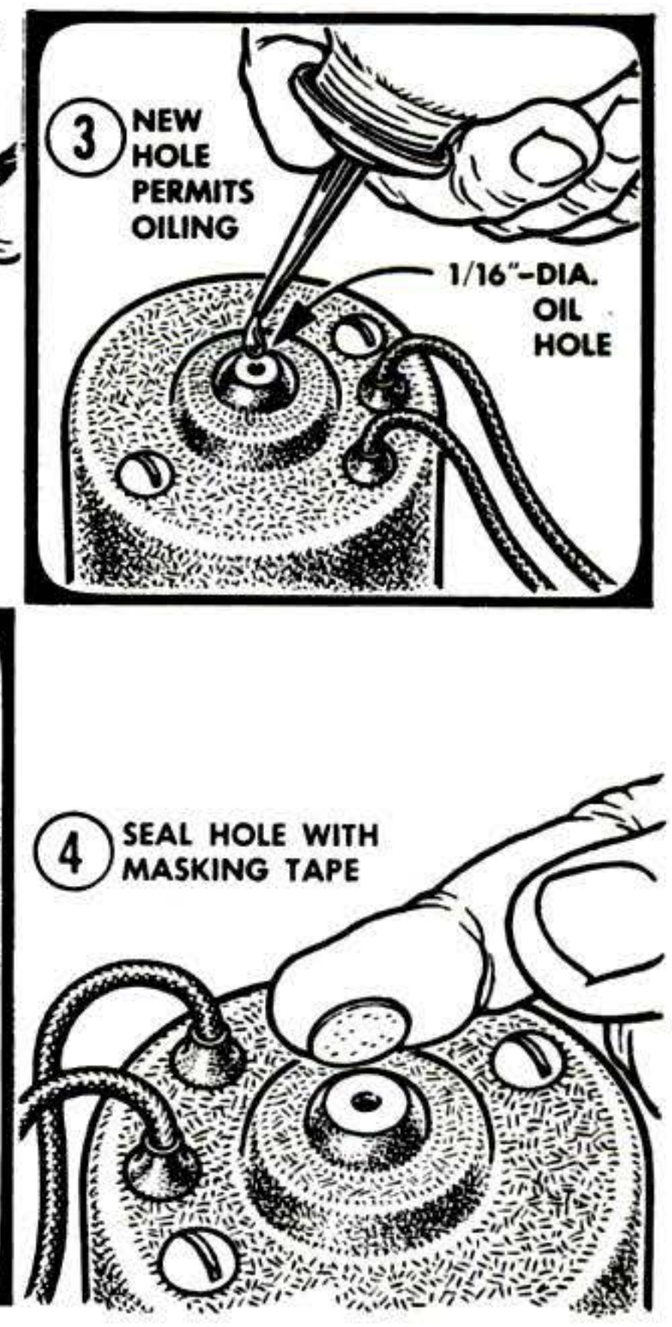
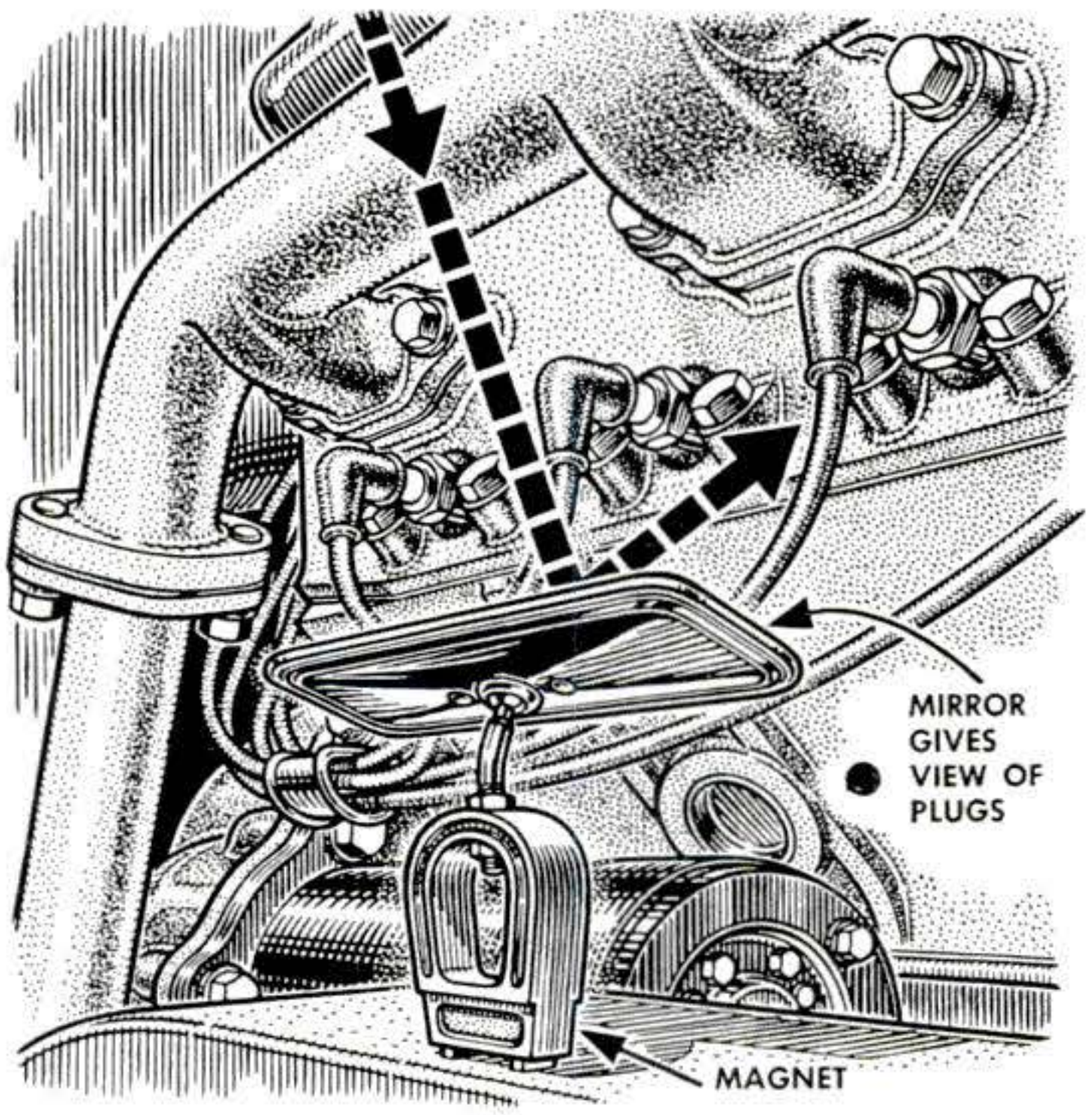


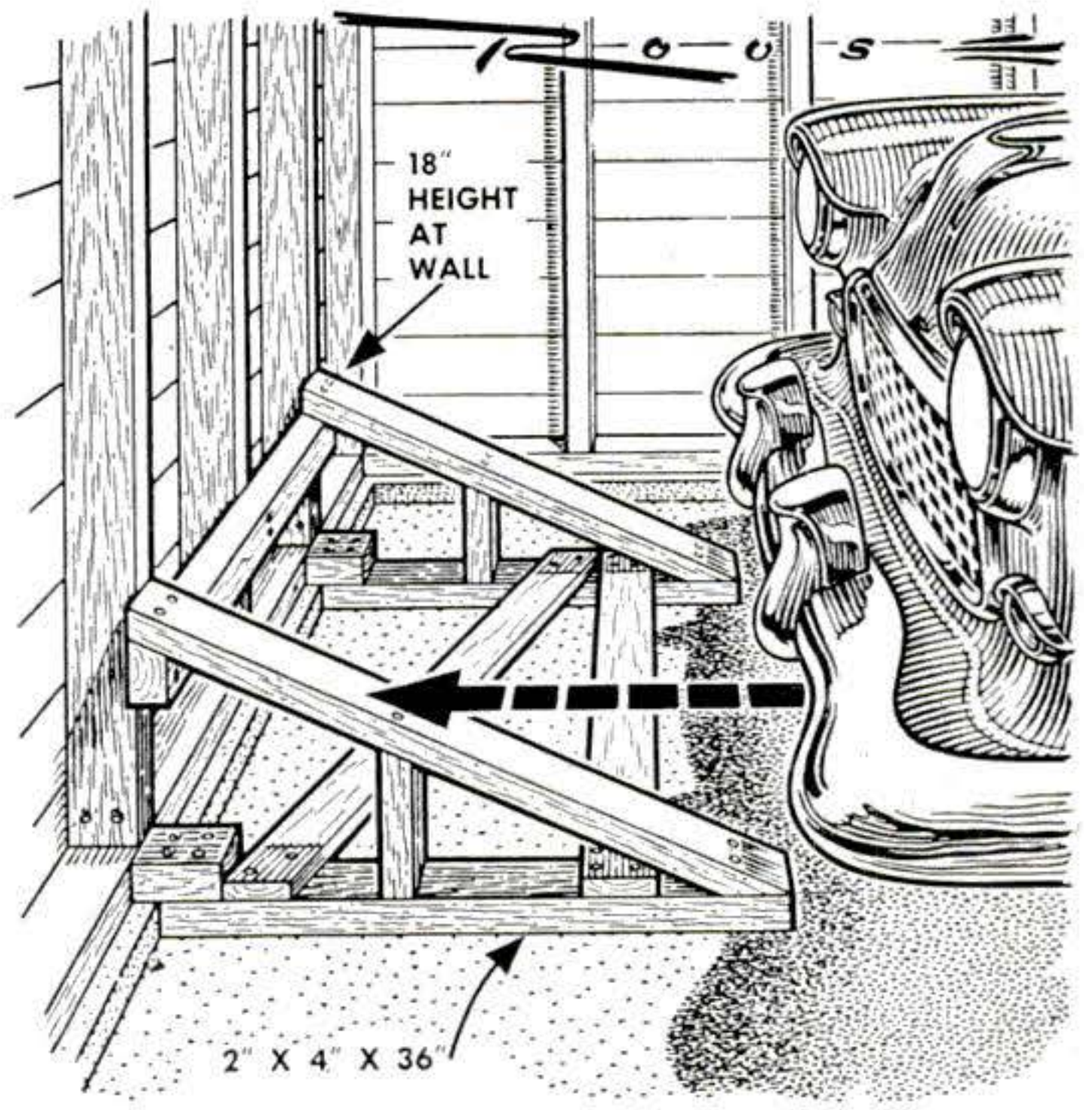




Small heater and electric-wiper motors are often neglected because they must be taken apart to be oiled. A drop in efficiency results. Simplify the problem by providing an oil hole in the sealed housing-end. File the metal thin but not through, then punch a small hole directly over the shaft. Light oil can be fed to the rear bearing through this hole, and the hole sealed against dust with a disk of masking tape. Oil can be trickled down the shaft to the front bearing.



To help you see beneath the manifolds when installing plugs in new V-8s, fasten an old rear-view mirror to a husky magnet. Place it on the frame with the mirror aimed at the plug openings and you can work without feeling your way.



A tapered car-stop of two-by-fours built against the garage wall serves a double purpose: It prevents accidentally ramming the wall; and as the bumper rides up on it, the car's weight is off the front springs, postponing front-end sag.

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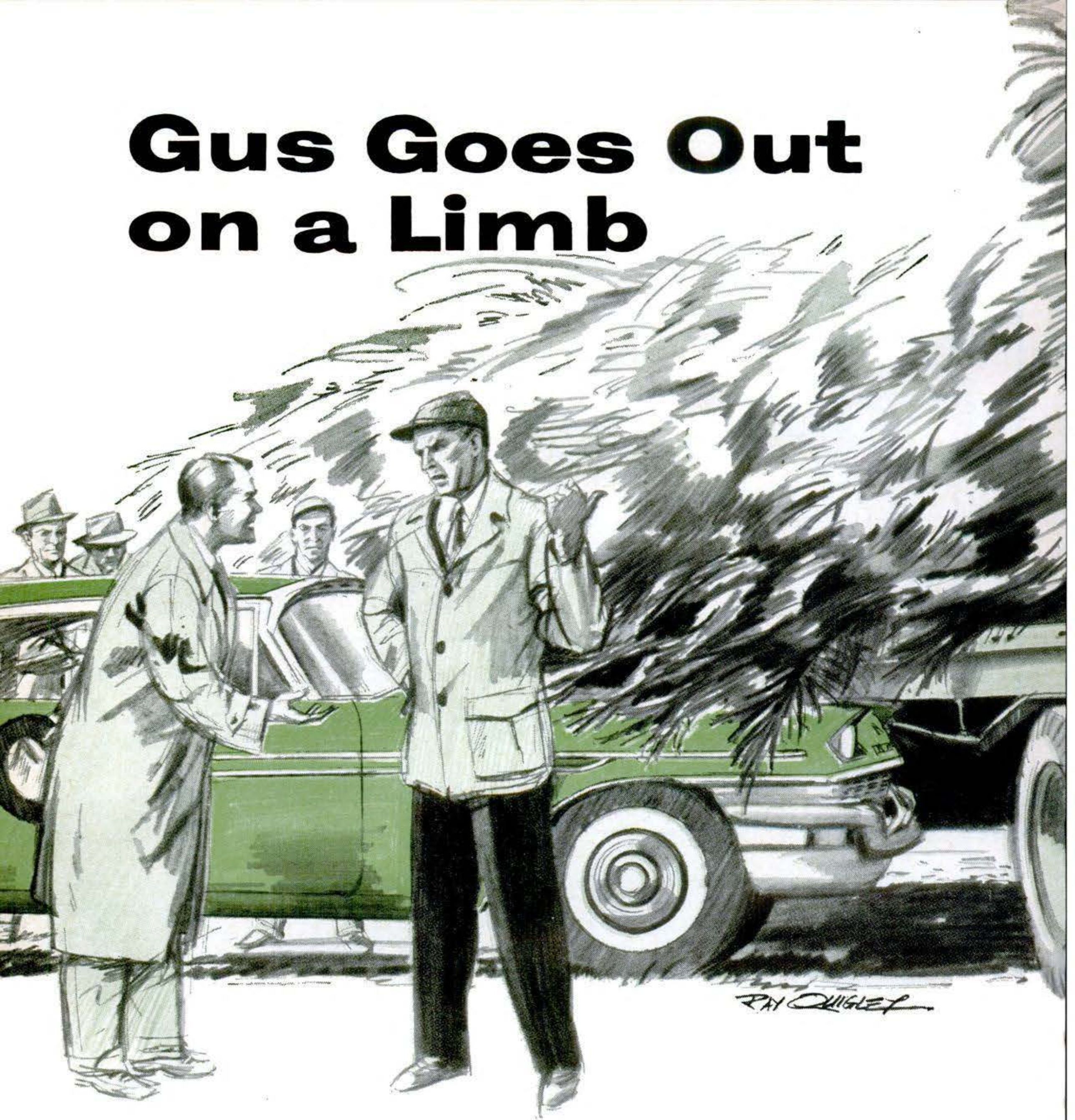
Gus Goes Out on a Limb



In suburban Meadowville any plant bigger than a rose bush was an oddity. How had Bert Hibbard managed to run into a tree?

By Martin Bunn

THE Model Garage had just opened its doors for business when Bert Hibbard telephoned excitedly from Meadowville.

"Get out here fast, Gus," he pleaded. "My car's stuck under a tree, in front of my garage. I'll be late to my office."

"Under a *tree*?" Gus asked, astonished.

Gus knew there wasn't a shrub in Meadowville bigger than a rose bush or lilac. In fact, every house in Meadowville had exactly three roses and two lilacs—what the contractors had supplied.

"A tree!" Gus repeated. "Are you feeling all right, Bert?"

"How could I feel all right?" Hibbard snapped. "I can't get to my office and neither can Orville Bullow. This tree

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When Gus arrived in Meadowville, the place was jumping like a beehive in spring.

has us both cornered. If I'd known that Mike Regan was going to buy a house on the same street I'd never . . ."

Hibbard's voice ceased, to be replaced in the receiver by what seemed to Gus to be several voices raised in heated discussion. Gus hung up and jumped into his service truck. Stan Hicks, Gus's helper, came to the cab.

"What's up, Gus?" he asked.

"Maybe I'm crazy, Stan," Gus said, "but a tree seems to have cornered a couple of fellows in Meadowville."

"Tree!" Stan Hicks said hollowly, as Gus drove out. "In Meadowville?"

MEADOWVILLE, when Gus arrived, was jumping like a beehive in spring. The morning exodus of suburbanites was in progress. Up and down the

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long, neat rows of houses, men were gulping morning coffee, rushing to cars to get to work. As Gus pulled up before Bert Hibbard's place an astonishing sight met his eyes. A truck with a long, flat-bed trailer behind it was stalled before the Hibbard home. On the truck and trailer rested an ornamental evergreen tree that appeared to be all of 30 feet in length.

It was about a foot thick at the butt, the roots encased in earth, which was retained about them by a wrapping of burlap sacking, creating a dirt ball that must have weighed easily two tons. Bert Hibbard's late-model sedan had its snout buried under the tree and the trailer bed, just ahead of the rear wheels.

GATHERED about the scene of the collision were Bert Hibbard; his next-door neighbor, Orville Bullow; Mike Regan; Al Roper, the truck driver; and his helper, Tom Clark. Gus pulled up against the opposite curb and walked over.

"Hibbard must have been stone blind, Gus," Al Roper announced. "He came shooting out of his driveway and banged right into my truck."

"Truck!" Hibbard retorted. "I saw the truck all right, when it came around the corner. I didn't expect you to have Sherwood Forest trailing along behind it. This is a residential street, Roper, not a logging camp."

Mike Regan's blue eyes glittered with fury. "Just because I happen to want a bush on my lawn, Hibbard, is no reason that you have to rush out and sabotage the operation."

"Bush?" Orville Bullow protested. "That thing is so long that it blocks my driveway and Hibbard's too. If it's a bush, I'm a beagle."

Mike Regan's eyes moved over Bullow's squat figure. "The resemblance," he remarked, "is quite obvious."

Hibbard said angrily, "How do you propose that Bullow and I get to work?"

"Don't ask me," Regan said, shrugging his shoulders. "After all, Hibbard, you ran into my tree."

"I was late," Hibbard said. "I came down my driveway like I always do. I saw the truck, and then before I knew it I was under this monstrosity you had hauled in here."

"This isn't getting you fellows off to work," Gus cut in. "Now let's see how we're going to clear this tangle. Maybe you can back your car out, Hibbard, if we get our shoulders under the tree limbs and lift it off the hood."

"Not a chance," Hibbard said. "My motor won't start. That's why I called you."

Gus tried the motor, and got no response. With the hood of the car under the tree, he couldn't get at the motor, either, to discover what was wrong. And, since the car was still in Hibbard's driveway, Gus couldn't get behind it with his tow truck to tow it back. It was wedged too firmly under the trailer to be pushed back by manpower, and the truck could not be moved, either forward or back, without extending the damage to Hibbard's trapped car.

"All you have to do, Gus," Hibbard said, "is to hook on to the back end of the trailer and pull it sideways off my car."

"Not that easy," Gus said. "I haven't got enough traction or power to slide the four rear tires of that trailer around on this rough cement with my truck—not with the load they're carrying."

Bullow inquired gloomily, "Well, what are we going to do then—call in a couple of Army tanks?"

LIGHTING his pipe thoughtfully, Gus walked around the car and truck, studying the situation. Passing the open door of Hibbard's garage he noticed a piece of sheet-metal on the floor, placed there, no doubt, to keep grease drippings from the cement. The sheet was about four feet long by three wide.

"You wouldn't have another piece of this around, would you, Bert?" he inquired.

"Why ask foolish questions?" Mike Regan said disgustedly. "On this street what one man has, so has the other—three roses, two lilacs, one drip pan in his garage. You'll find one of those, Gus, in every garage down the street."

"Fine," Gus said. "In that case, Regan, how about borrowing yours?"

GUS got a can of heavy grease from his truck and smeared it over the two sheets of galvanized steel. Using heavy hydraulic jacks that he always carried in the service truck, he managed to get

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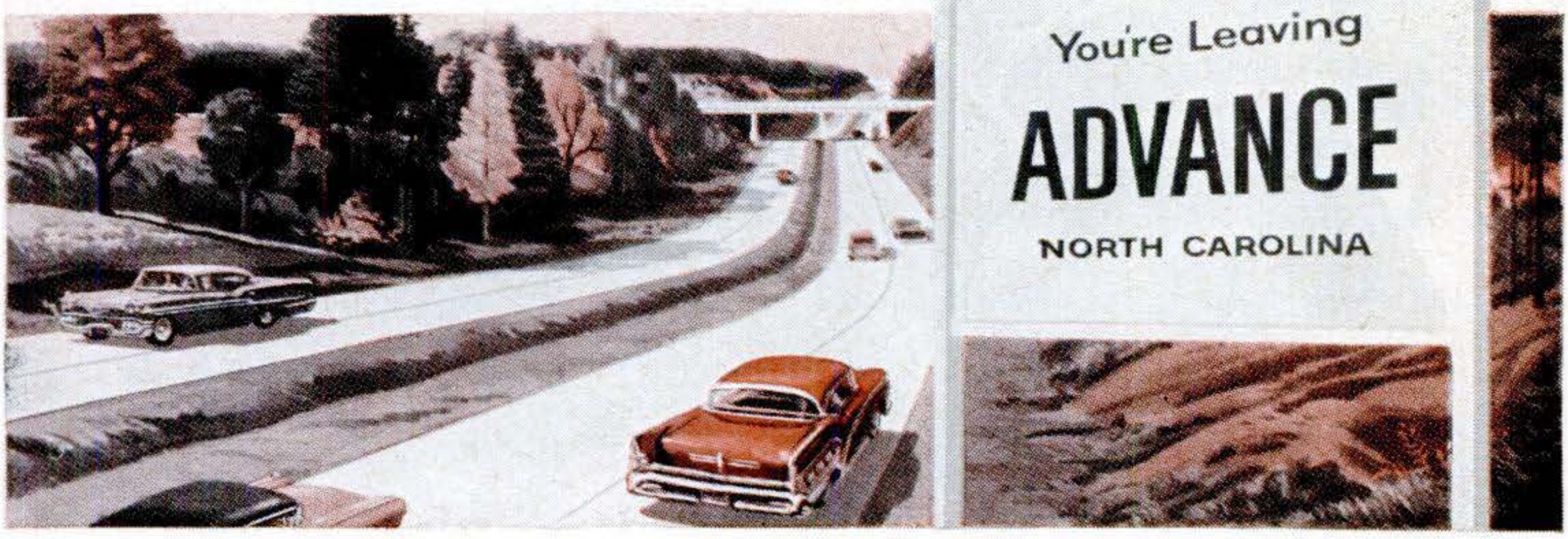
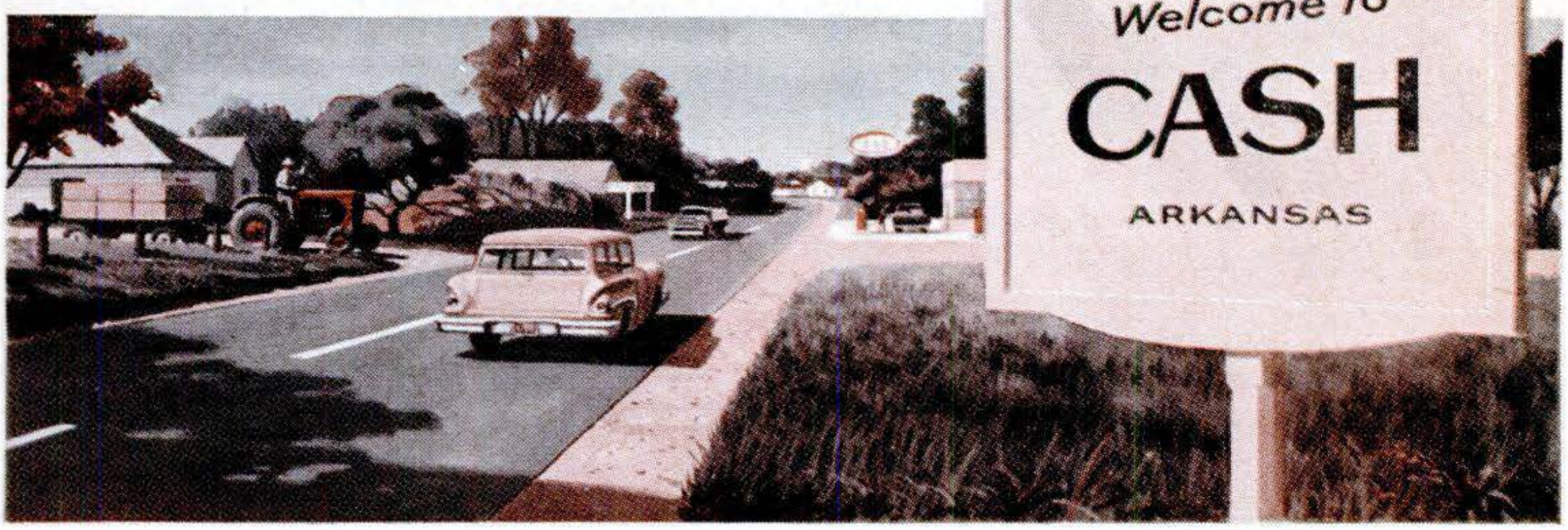


FROM

Advance to Cash

652 MILES—32¢



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GM FORWARD FROM FIFTY

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the sheets under the rear tires of the trailer. He then hooked on to the rear of the trailer and maneuvered the service truck around so he could get a side pull by nosing up into the driveway of the house across the street. With the tow car in compound low the trailer end was skidded sideways quite easily, sliding on the greased steel. Hibbard's car was free. The truck, which was undamaged by the collision, pulled up the street and began backing into Regan's yard, where a huge hole had been dug to receive the tree.

"Is this the one that's stuck, Helen?"

"Now we can get your hood up, Hibbard," Gus said, "and see why your engine won't start."

The low hood of the car had been punched down in the middle by the collision, but Gus was able to get it open. He found that the huge air cleaner on the carburetor, which barely cleared the hood when it was closed, had been jammed down on the carburetor air horn to such an extent that it had bent the throttle rod, locking it in such a tightly closed position that the motor could not get even idling gas.

Gus straightened the rod, set up the idling screw a bit. The motor started immediately now. Gus adjusted the idle and managed to push up the downward bend in the hood enough so that it would close properly.

"My insurance company will settle the bill, Gus," Hibbard said as he got into the car. "But probably they'll cancel my policy if they find out I'm living on the same street with that crazy Regan. Imagine a man having a tree of that size hauled into this community."

Gus moved his eyes over the long rows of almost identical houses, a contractor's delight. Here every man was master of the destiny of his home—perhaps for the first time. Most of these people had come here from rented apartments, with landlords to limit their freedom of expression. Each house here, then, was the beginning of the fulfillment of a dream, but only the beginning. Gus wondered how long Mike Regan had been dreaming of his own lawn with a big shade tree to sit under.

"You know, Hibbard," Gus said reflectively, "with Mike it was a tree. With you and the others it might be a glass hothouse, flowers, a hurricane fence, maybe nothing more than a dog kennel. These homes only look the same now because each family hasn't had time yet to work out its own ideas. Regan, with his tree, just started what you'll all be doing in time."

Hibbard paused, "I never looked at it that way, Gus," he said. "Maybe you're right. My wife and I have ordered bricks and stuff to build a barbecue pit . . . Well, I'd better get to the office. Sliding that trailer around on greased skids was a neat trick. Thanks."

Driving back, Gus pondered. His solution had worked fine. Still he had a nagging question—couldn't he have managed it some other, simpler way?

AT THE Model Garage, he told Stan how he'd untangled Hibbard's car.

"Gee, Gus," Stan said, "that was a neat trick."

Stan was silent a moment. Then he added innocently, "But Gus, why didn't you take some air out of Hibbard's front tires? Wouldn't that have lowered the car enough to push it back?"

Gus clapped his hand to his forehead and let out a low groan. END

Next Month: Gus bails out a teen-ager.

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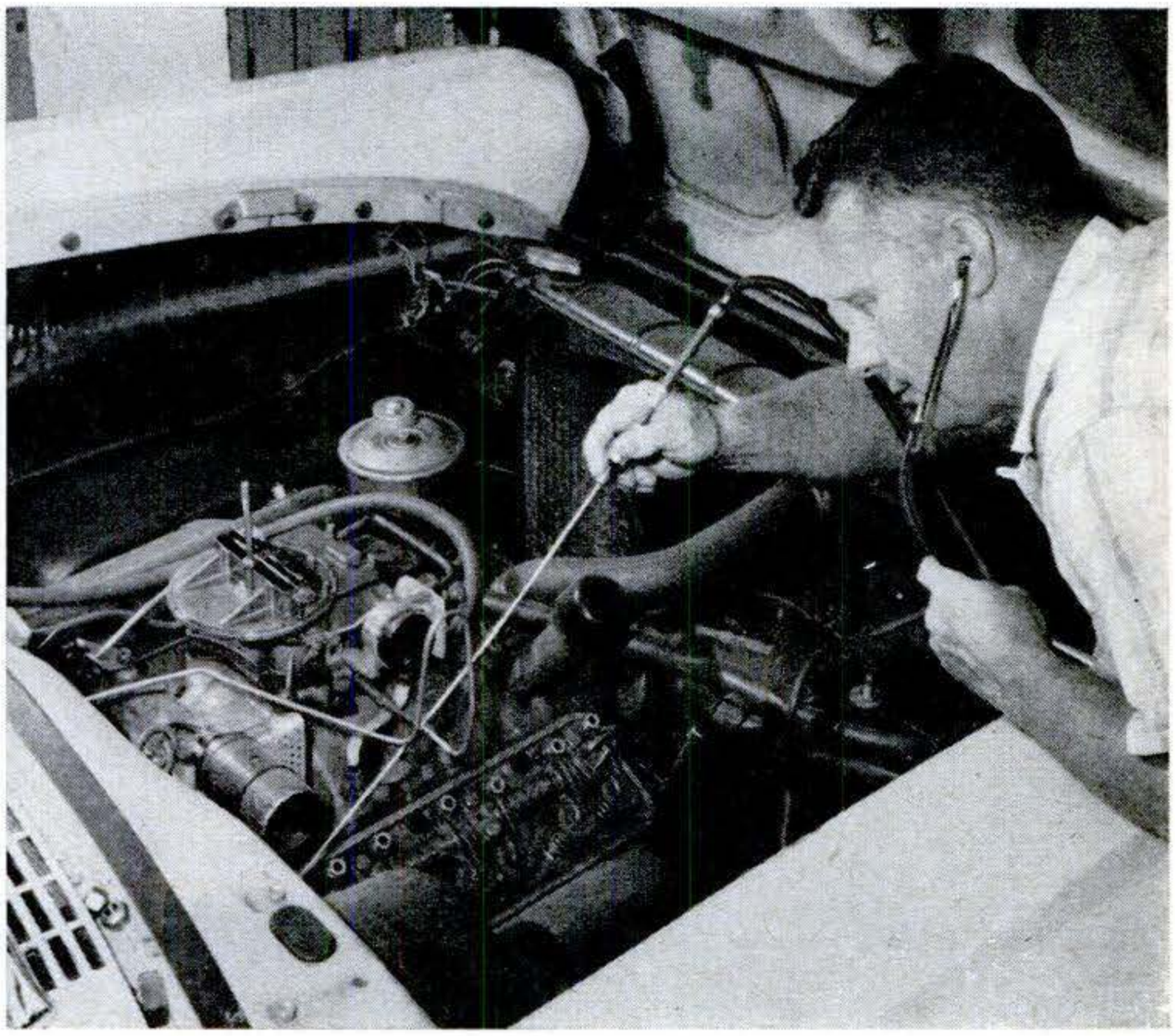
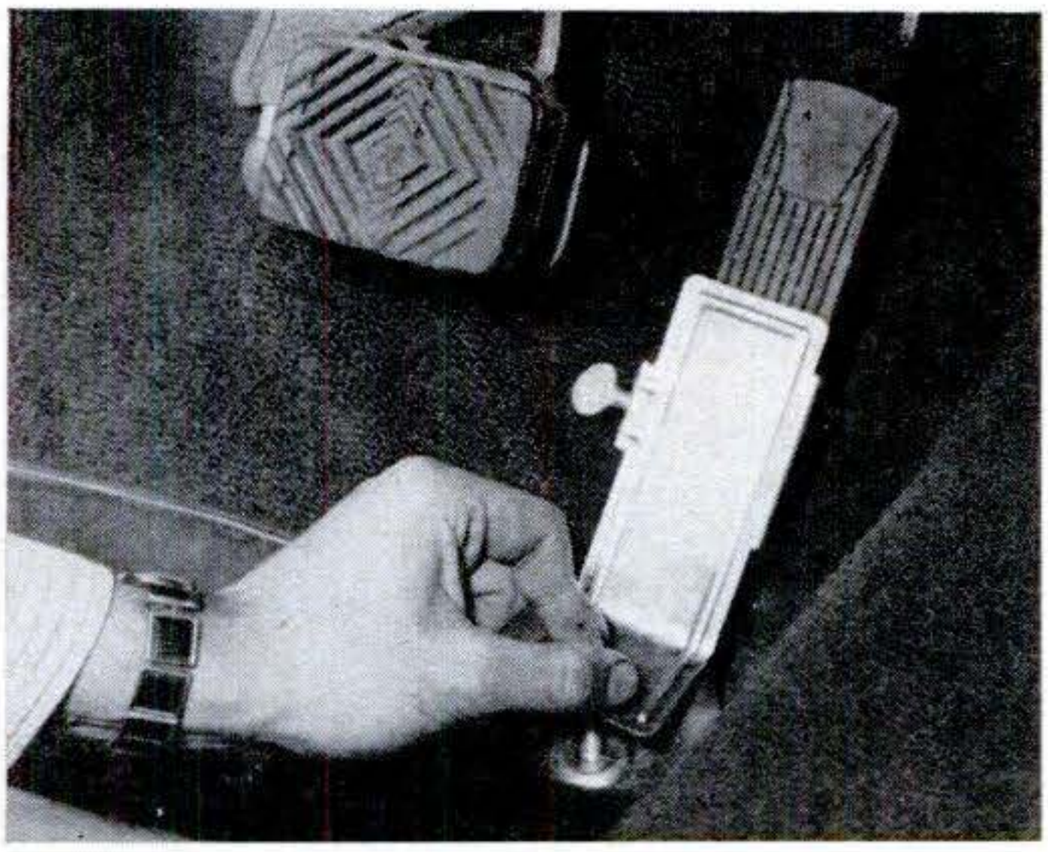
New for Your Car

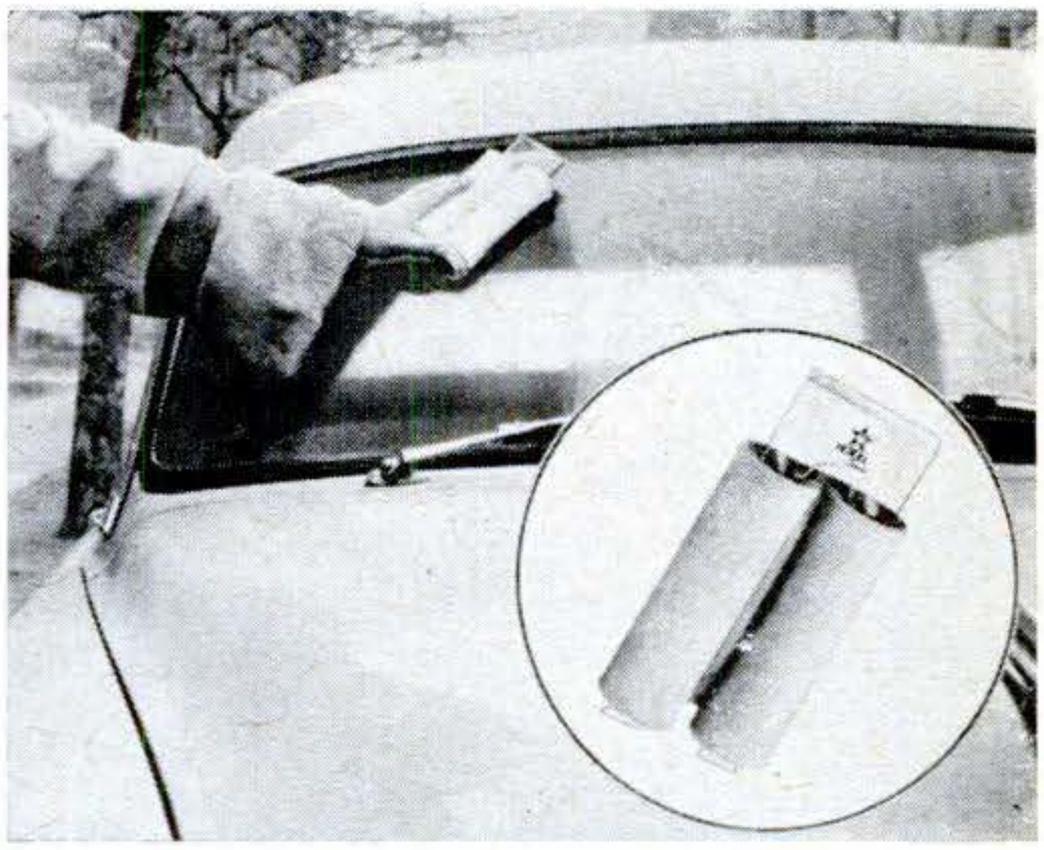
1. A stethoscope for mechanics sorts out noises and helps medics in overalls diagnose ailments in mechanical equipment. A spring-steel diaphragm in the body amplifies sounds picked up by the probing needle.

With the earphones in place, you can quickly pinpoint and identify noises in the engine or body of a car. The stethoscope is said to be so sensitive that you can hear water running through a pipe and even tell which washer is leaking in a hot-and-cold mixer faucet.





2. Pedal hold-down keeps a car running at a fast idle to warm up the engine on cold mornings. You can also use it to keep the car chugging at charging speed to pep up a weak battery. Clamped to the accelerator pedal, it does a better job than a stick propped between the pedal and the seat: Vibrations won't dislodge it and you can adjust it for the speed you want. It is not intended for use when the car is driven on the road.



3. Windshield roller cleans dirt and smudges from the glass with no wetting. A specially treated cloth stretched between two spools on a pronged holder forms a flat wiping pad. A few turns of the spools reels out a clean section and when all the roll is soiled, you can drop it in the washing machine. One edge of the holder is beveled for scraping ice from the windshield. It will also remove paint spatters from house windows.

More information *about the products shown on this page can be obtained from: 1. Rinck-McIlwaine, Inc., 16 Hudson St., New York City; 2. Badger Tool & Manufacturing Co., 1501 W. Polk St., Chicago 7, Ill.; 3. Industrial Wiping Cloth Co., Inc., 29-28 41st Ave., Long Island City 1, N.Y.*

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How to Buy a Good Tape Recorder

What will you record? Baby's gurgle? A symphony? Business letters? Before shopping, check your plans—and the facts here

By Robert Gorman

THE important questions you have to answer in shopping for a tape recorder are How Much? and How Good?

You'll find a wide choice under both headings. The chart on the next two pages gives manufacturers' specs for a sampling of current models in the under-$400 price class. It shows that even the least expensive machines do an acceptable job of recording and reproducing sound, while those in the top brackets come close to what audiophiles call the "ultimate" in high fidelity.

In between, you'll find a host of excellent all-purpose recorders; the ones that retail for $150 to $200 are the best sellers, and generally the best buys.

But at every price, machines differ in important qualities and operating features. How much they are worth to you depends to a great extent on who will use your machine, how, and for what. You'll find it easiest to pick a just-right model if you consider what a recorder is and how it works.

How a recorder works. Basically it is a device that harnesses electronics, magnetism and mechanics to print invisible sound tracks on ribbons of coated plastic. It does this by changing sound waves into electrical signals and passing the signals through the coil of an electromagnetic recording head. This sets up a rapidly varying field across the poles of the magnet. As a strip of tape moves past the gap, magnetic energy rearranges iron-oxide particles in the tape coating.

You can't see or feel this magnetic sound track, but you know it's there because you can play it back through a similar head (or the same one) wired to reverse the whole process.

Magnetic sound is as permanent—or as temporary—as you want it to be. You can play a recording thousands of times, or erase a track and put a new one in its place.

These bands of sound, incidentally, are extremely narrow, and all current home recorders are now dual-track machines. This means they make two entirely separate recordings along opposite edges of a ¼-inch-wide tape. Normally

Five important features to look for in a tape recorder

HERE are five of the characteristics that add up to top-notch performance in a tape recorder. Use these in checking through the table of manufacturers' specs on the following pages.

- *Broad Frequency Response.* A wider range of sound frequencies (in cycles per second) means higher fidelity. But look also for lower decibel (db.) variation for better response.
- *Low Flutter and Wow.* This is a sign of a good tape transport.
- *High Signal-to-Noise Ratio* ensures lower background hiss, cleaner recordings, better tape sound.
- *Adequate Power.* For built-in sound equal to that of a good phonograph (or for use in a large hall) a recorder should have six or more watts of output power. For ordinary use, two watts is ample.
- *Ease of Operation.* Foolproof interlocks, a tape counter and a reliable record-level indicator help you make—and keep—good recordings.

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All the details about the new Tape Recorders

BRAND NAME	MODEL	APPROX. PRICE	STYLE	APPROXIMATE WEIGHT (pounds)	APPROXIMATE DIMENSIONS (inches) H X W X D	TAPE SPEEDS (inches per second)				FREQUENCY RESPONSE (cycles)	
						1⅞	3¾	7½	15	At 3¾ in./sec.	At 7½ in./sec.
AMPRO	758	$250[a]	portable	44	11 x 16 x 17		√	√		40-6,000±3db.	40-15,000±3db.
BELL AND HOWELL	775-G	$190	portable	38	10 x 15 x 16		√	√		70-5,000±5db.	50-13,000±4db
	730G-1	$270	portable	39	17 x 17 x 10		√	√		70-7,500±5db.	50-15,000±3db.
	300M	$300[b]	table	42	11 x 19 x 14		√	√		70-7,500±5db.	50-15,000±3db.
BELL SOUND	RT204	$180	portable	35	8 x 15 x 18		√	√		30-6,000±3db.	30-12,000±3db.
	BT76	$190	portable	35	9 x 17 x 15	√	√	√		30-5,000±3db. n.a. @ 1⅞"/sec.	30-10,000±3db.
EKOTAPE	270	$270[b]	portable	35	11 x 15 x 14		√	√		40-9,000±3db.	30-15,000±3db.
FEDERAL	FME	$160	portable	25	10 x 13 x 13		√	√		50-8,000±3db.	50-12,000±3db.
FERROGRAPH	3A/N	$380	portable	50	10 x 18 x 19		√	√		n.a.	50-10,000±2db.
MAGNECORD	N35B	$300	portable	40	12 x 16 x 14		√	√		50-5,000±2db.	50-10,000±2db.
PENTRON	NL-1	$110	portable	29	11 x 14 x 17		√	√		40-7,000±2db.	40-11,000±2db.
	NL-2	$150	portable	33	11 x 14 x 17		√	√		40-7,000±2db.	40-13,000±2db.
	NL-3	$190	portable	38	11 x 17 x 18		√	√		40-7,500±2db.	40-15,000±1.5db
PHILCO	TR-100	$200	portable	32	10 x 16 x 15		√	√		40-7,000±4db.	40-12,000±3db.
RCA	7TR2	$160	portable	33	9 x 18 x 15		√	√		90-5,000	90- 8,000
	7TR3	$200	portable	36	9 x 18 x 15		√	√		70-5,000	70-12,000
	7TRC1	$280	consol.	56	35 x 22 x 17		√	√		80-5,000±4db.	80-10,000±4db.
RECORDIO	702	$100	portable	26	8 x 14 x 12		√			85-7,000	
	712	$100	portable	26	8 x 14 x 12			√			85- 8,500
	732	$130	portable	26	8 x 14 x 12		√	√		n.a.	85- 8,000
	752	$170	portable	30	9 x 15 x 14		√	√		n.a.	65-10,000
	782	$270	portable	47	17 x 17 x 11		√	√		n.a.	65-15,000±3db.
REVERE	T-1100	$170[a]	portable	27	10 x 14 x 14		√	√		85-7,000±3db.	75-12,000±3db.
	T700D	$225[a]	portable	30	10 x 17 x 15		√	√		40-7,500±3db.	40-14,500±3db.
	T700	$235[a]	portable	30	10 x 17 x 15		√			80-8,000±3db.	
	T10	$245[a]	portable	30	10 x 17 x 15			√			60-15,000±3db.
SYMPHONIC	210	$150	portable	28	n.a.		√	√		80-6,000±5db.	80-12,000±5db.
	R-1200	$189	portable	34	10 x 15 x 15		√	√		50-7,000±5db.	50-12,000±5db.
TANDBERG	No. 2	$250[d]	portable	22	7 x 15 x 12	√	√			50-8,000±2db. 50-4,000±2db. @ 1⅞"/sec.	
	No. 3	$300[d]	portable	22	7 x 15 x 12	√	√	√		50-8,000±2db. 50-4,000±2db. @ 1⅞"/sec.	30-16,000±2db.
TAPESONIC	70-C	$399	portable	65	11 x 23 x 16		√	√	√	n.a. 30-18,000±3db. @ 15"/sec.	30-15,000±3db.
TELECTRO	1960	$80	portable	16	8 x 12 x 11		√	√		80-7,000±3db.	80- 8,500±3db.
V-M TAPE-O-MATIC	710	$190	portable	32	10 x 16 x 15		√	√		40-7,000±4db.	40-12,000±3db.
	750	$260	table	44	11 x 23 x 20		√	√		40-7,000±4db.	40-12,000±3db.
WEBCOR	2719	$150	portable	34	10 x 17 x 15		√	√		50-7,500	50-12,000
	2811[e]	$200[a]	portable	42	10 x 18 x 17		√	√		70-7,000±3db.	50-12,000±3db.
	2812[e]	$250[a]	portable	51	11 x 19 x 19		√	√		50-7,500±3db.	40-15,000±3db.
	2816[e]	$290[a]	portable	45	12 x 17 x 20		√	√		50-7,500±3db.	40-15,000±3db.
WOLLENSAK	T-1500	$190	portable	18	7 x 12 x 10		√	√		40-8,000±3db.	40-15,000±3db.

NOTE: n.a. Information not available [a] Also available, at added cost, with built-in radio
Chassis with same specifications also available in more expensive cabinet

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[redacted]	FLUTTER AND WOW (percent)	REWIND SPEED (feet per second)	FAST FORWARD (feet per second)	SIGNAL TO NOISE RATIO (db.)	GAP WIDTH (inches)	MAX. POWER OUTPUT AT 5% DISTORTION (watts)	SPEAKERS (number and size)	INPUT CONNECTIONS	OUTPUT CONNECTIONS	RECORD-LEVEL INDICATOR	TAPE REVOLUTION COUNTER	EDITING CONTROL	ARE ROLLERS RELEASED WHEN POWER IS INTERRUPTED[c]	NUMBER OF MOTORS
	.3	10	6	45	.00025	3	1-6" x 9", 1-3½"	2	2	tuning eye	no	no	yes	1
	.35	15	15	40	.0003	5	2-5¼"	1	1	dual neon	yes	yes	no	1
	.2	20	20	40	.0003	8	1-10"	2	2	dual neon	yes	yes	yes	3
	.2	20	20	40	.0003	8	2-8"[e]	2	2	dual neon	yes	yes	yes	3
	.4	20	20	50	.00025	5	1-6"	2	2	single neon	no	no	no	3
	.25	17	13	45	.0004	5	1-6" x 9"	3	2	single neon	no	no	no	1
	.2	19	19	45	.0004	8	1-3", 1-6" x 9"	1	2	VU meter	yes	yes	no	1
	.15	13	13	46	.0005	3	1-5" x 7"	1	2	single neon	yes	yes	no	1
	.2	30	30	45	.00025	10	1-6" x 10"	2	2	VU meter	no	no	yes	3
	.3	30	7	45	.00035	8	1-6" x 9"	2	2	VU meter	no	no	no	2
	.4	14	16	45	.00025	4	1-6"	2	2	single neon	no	no	no	1
	.4	14	16	48	.00025	5	1-4", 1-6"	2	2	tuning eye	yes	no	no	1
	.4	14	16	50	.00025	10	4-6"	2	2	VU meter	yes	yes	no	1
	.4	12	10	45	.0002	6	1-3½", 1-6" x 9"	2	2	dual neon	yes	yes	no	1
	.2	8½	8½	36	.00025	2	1-5" x 7"	2	1	dual neon	no	no	no	1
	.2	8½	8½	36	.00025	2	2-3½",1-6½"	2	2	dual neon	yes	no	no	1
	.2	8½	8½	36	.00025	5	1-8", 2-3½"	2	2	dual neon	yes	no	no	1
	.5	n.a.	n.a.	35	.0002	3	1-4"	2	1	dual neon	no	no	no	1
	.3	n.a.	n.a.	35	.0002	3	1-4"	2	1	dual neon	no	no	no	1
	.35	n.a.	n.a.	35	.0002	3	1-4" x 6"	2	1	dual neon	no	no	no	1
	.35	n.a.	n.a.	35	.0002	3	1-5" x 7"	2	1	dual neon	yes	no	no	1
	.2	7¼	7¼	35	.0002	8	1-3½", 2-6" x 9"	2	2	dual neon	yes	yes	no	1
	.3	13	13	48	.00025	5	2-5¼"	1	1	dual neon	yes	yes	no	1
	.3	13	13	48	.00025	5	1-6" x 9"	1	1	dual neon	yes	yes	yes	1
	.3	13	13	50	.00025	5	1-6" x 9"	1	1	dual neon	yes	yes	yes	1
	.3	13	13	50	.00025	5	1-6" x 9"	1	1	dual neon	yes	yes	yes	1
	.3	6	6	42	.0002	3	1-3½", 1-5" x 7"	2	2	dual neon	yes	no	no	1
	.3	12	12	45	.0002	7	1-3½", 1-6" x 9"	2	2	dual neon	yes	yes	no	1
	.2	20	20	52	.00025	5	1-5½" x 7"	2	1	tuning eye	yes	yes	no	1
	.18	14	14	55	.00025	5	1-5½" x 7"	2	1	tuning eye	yes	yes	no	1
	1	35	35	50	.0003	14	1-8"	1	2	VU meter	no	yes	yes	3
	3.0	n.a.	n.a.	45	.0002	1	1-6"	1	0	single neon	no	no	no	1
	.4	12	10	45	.0002	6	1-3½", 1-6" x 9"	3	2	dual neon	yes	yes	no	1
	.4	11½	9½	45	.0002	6	1-3½", 2-8"	2	2	dual neon	yes	yes	no	1
	.4	11½	11½	50	.00035	5	1-6"	1	2	tuning eye	yes	yes	no	1
	.4	11½	11½	45	.00035	5	1-4", 1-5" x 7"	1	2	tuning eye	yes	no	no	2
	.4	11½	11½	45	.00035	8	2-4", 1-6" x 9"	1	2	tuning eye	yes	no	no	2
	.4	11½	11½	45	.00035	8	1-6"	1	2	tuning eye	yes	no	no	2
	.3	10	10	48	.00025	10	1-5¼"	2	2	dual neon	yes	yes	yes	1

[e] Plus two electrostatic speakers [d] Also available, at added cost, with pedal-operated solenoid switches
[c] Records in both directions, eliminating reel turnover

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you play one track, then flop the reels to bring the second edge into position.

What about stereo sound? The fact that standard tapes can hold two independent recordings has given rise to an important new development—stereophonic sound.

When they tape a live musical performance, engineers now spot two or more microphones in different positions and end up with two separate but simultaneous recordings which are then "printed" along the top and bottom edges of a tape. Playing a stereo tape through dual magnetic heads, amplifiers and loudspeakers restores to music a more lifelike quality of space and direction.

Most tape-machine manufacturers are now marketing stereo players. Except for the extra playing heads, connections for external amplifiers and higher prices, many of them are identical with the models listed in the chart. In a number of cases, therefore, you can use the same data for evaluating stereo units. Adapter kits for converting most current models are also available, should you want to add stereo to a standard or "monaural" recorder later on.

If you are interested in stereophonic sound or in conventional high fidelity, look closely at those features that are related to musical quality. High on the list is the machinery that drives the tape.

Check the drive. Bringing the tape into position to take or play a recording calls for a complex array of drive wheels, pulleys, belts, clutches, and brakes. An electric motor drives a capstan, or metal shaft, and the capstan—aided by a pressure roller—drives the tape.

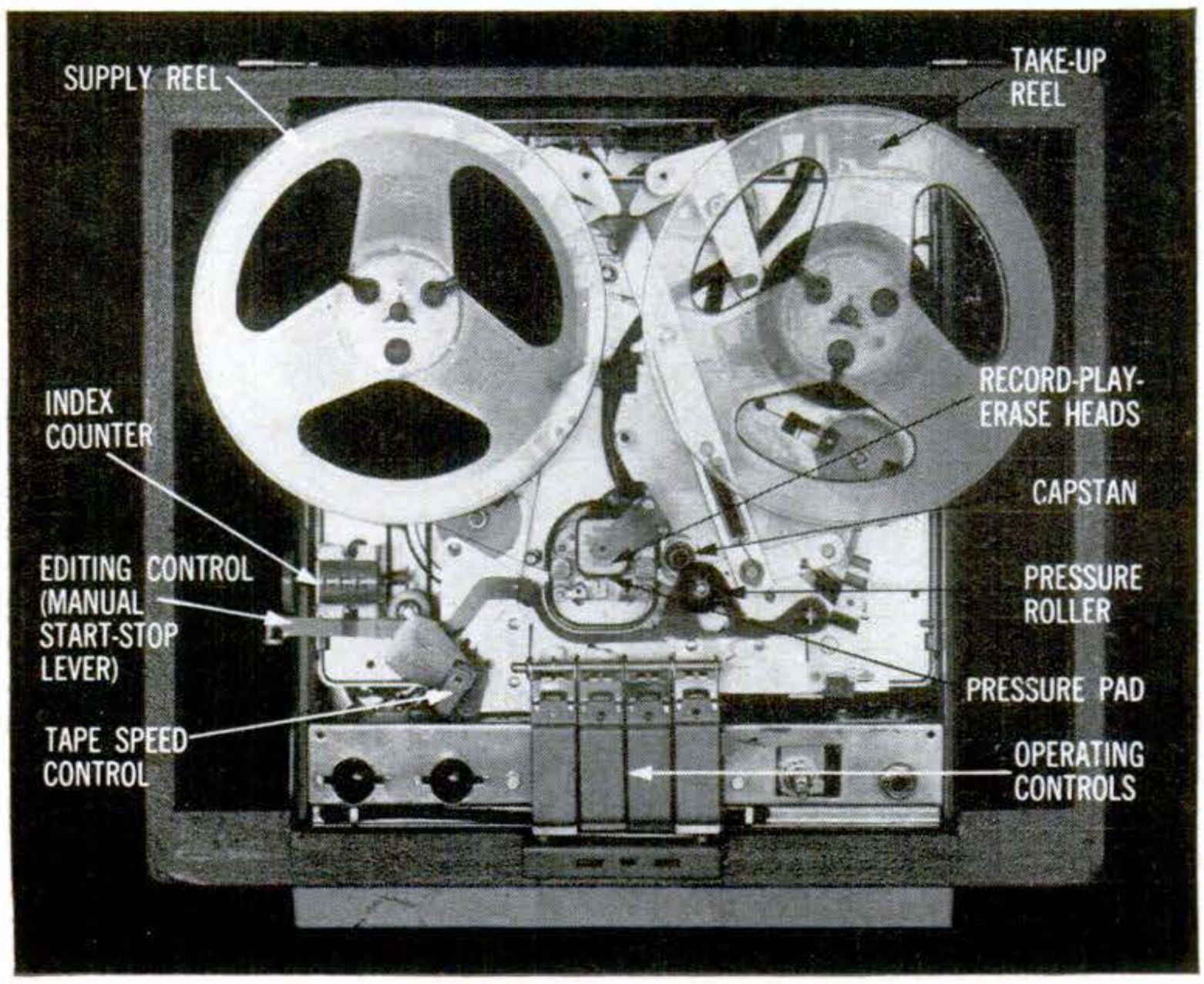
Very precise speed regulation is important to hi-fi because slight variations in tape travel can cause noticeable wavering, distortion, or change of pitch. The word "flutter" is used to describe the effect of rapid variations; slower irregularities are known as "wow."

The F & W figure is often closely related to the weight and price of a recorder. One reason is that a heavy flywheel helps to maintain constant speed. So does a better—and more expensive—motor. And machines built to meet the most exacting standards usually have two or more motors.

Why the extra motors? Well, tape must be transferred from one reel to another, so supply and take-up spindles also have to be driven—but at constantly varying speeds. The reason is that tape moves at a fixed rate while effective reel diameter keeps changing as tape is wound on or off. To provide for this, the take-up reel is driven through a clutch that allows plenty of slippage. During record and playback, the supply spool acts only as a lightly braked follower.

Before you can replay a tape, how-

[*Continued on page 264*]



Under-cover look at a recorder

THE WORKING PARTS of a typical tape transport are visible in this cover-off photo of a Revere T-700D. A pressure pad holds tape against magnetic head when machine runs, moves back when it stops. Most recorders have two magnetic heads—one to erase, another to record or play. A third head would let you monitor from the tape.

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New Home Wiring Screws to the Wall

You need just a screwdriver to extend your electrical circuits and add the outlets you want

By George Daniels

ADDING new electrical outlets can be almost as easy now as plugging in a floor lamp. Use modern, plug-in outlet strips. Plug one strip into an existing receptacle, add other strips to make the extension you need, screw them all to the wall as in the photo above—and the job is done.

These plug-in outlet strips are one of three new types of surface wiring that let you add outlets where you want them. With these strips, you can plug in lights as well as appliances anywhere.

With the plug-in strips, you do the entire job yourself. With the others you may want professional help; connections are required inside the wall. All types are attached to the wall with screws.

Surface wiring for homes was developed from the raceway wiring used for years in factories and shops. The two still have points in common. But the new home types have been dressed up for the living room.

What's the cost? The parts you need are widely available in hardware and electrical stores. You can expect to pay about a dollar per running foot for materials. This is more than the average materials cost for conventional in-the-wall wiring. But if you figure in the extra advantages, plus the saving in labor by doing your own work, you can put in

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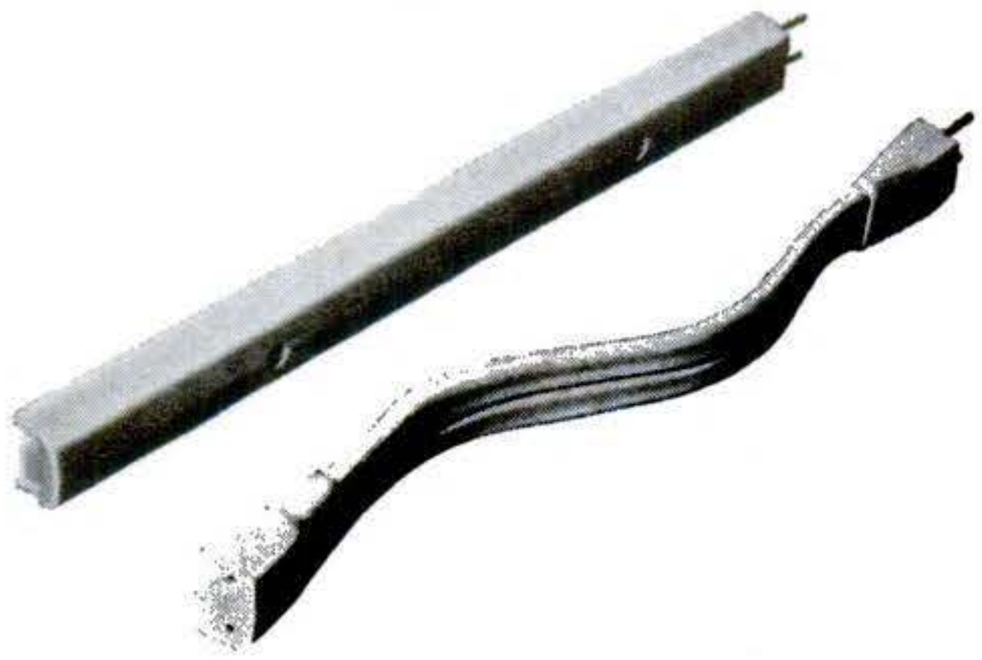
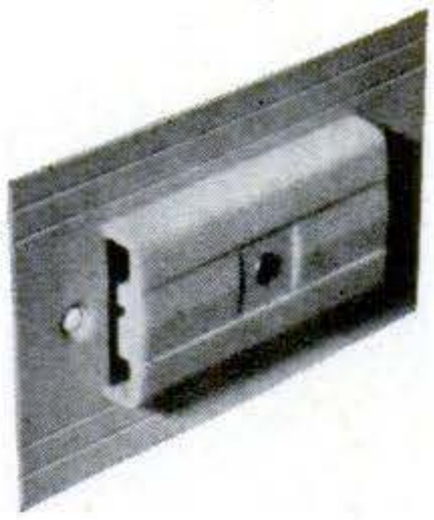
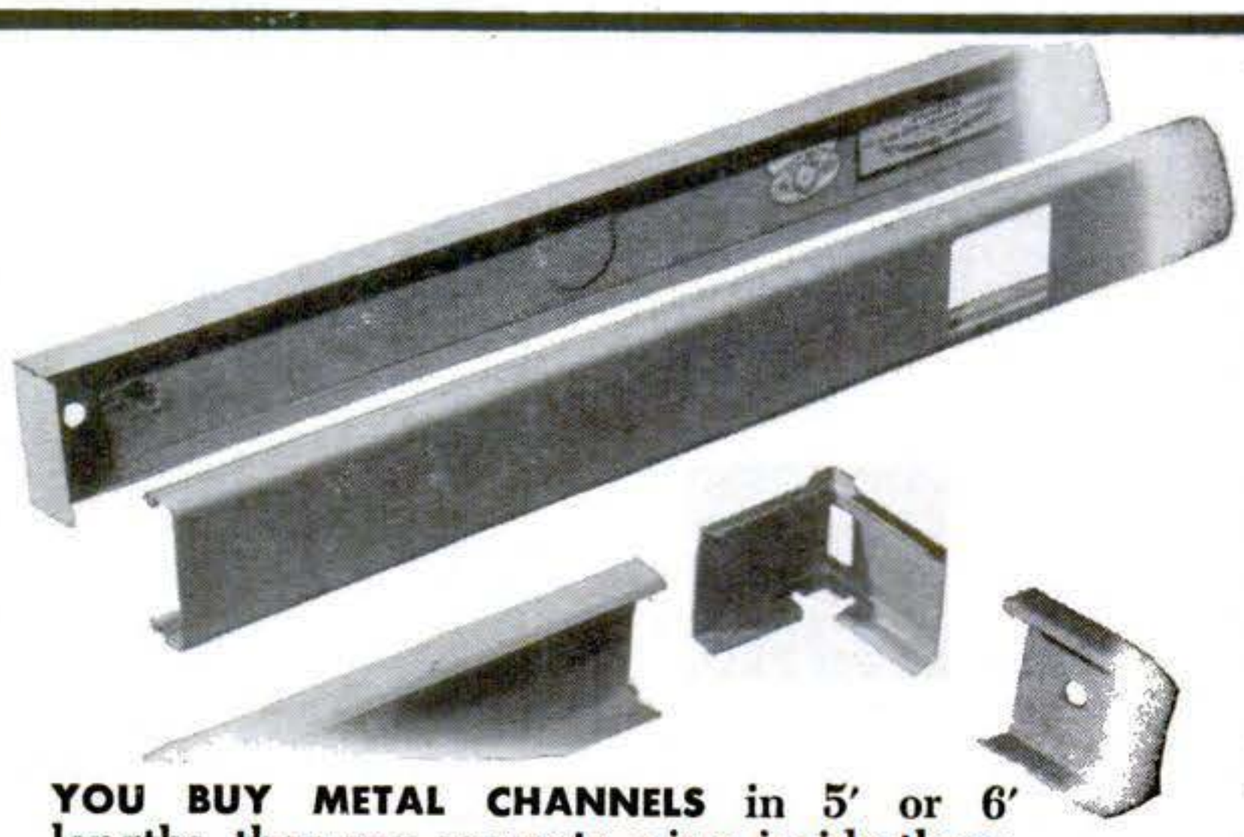
The parts you buy for surface wiring

	HOW TO CONNECT IT TO THE POWER LINE	HOW YOU RUN IT ALONG THE WALL
For the plug-in type	**PLUG STARTING STRIP** of rigid plastic into any existing outlet. That's all there is to it.	 **YOU BUY PLAIN SECTIONS** to carry current anywhere along the wall. Each is 12″ long, plugs into the next strip. To turn corners, you insert flexible strip (also shown).
For the flexible type	 **ADAPTER PLATE** is substituted for original receptacle and plate. Strip plugs into the adapter.	**YOU BUY FLEXIBLE STRIP** in length you need. It has two wires molded in plastic, costs about 54 cents a foot. Angle and T connectors let you turn corners, run branch lines.
For the metal type	**COVER PLATE** joins metal channel to any existing outlet box. Wires in box are fed out through hole.	 **YOU BUY METAL CHANNELS** in 5′ or 6′ lengths, then run separate wires inside them. Plain sections cost about 20 cents a foot, those with outlets about $1 a foot.

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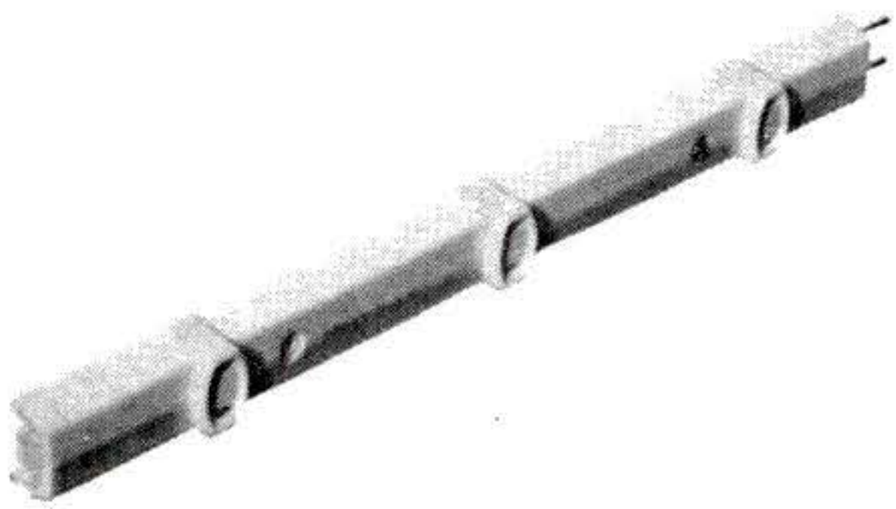
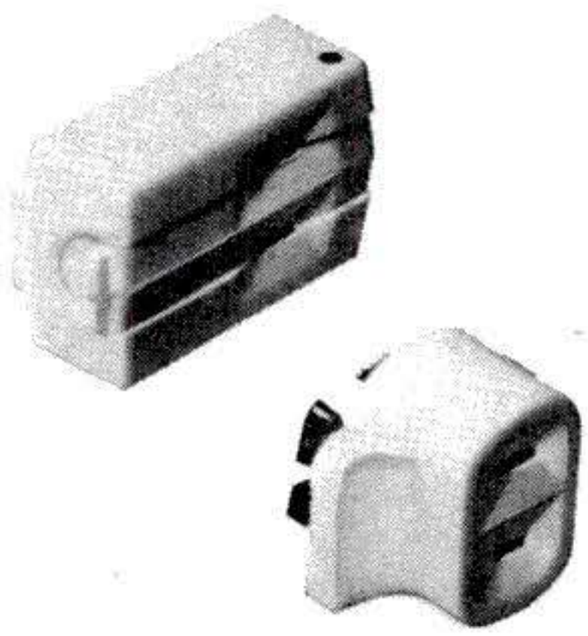
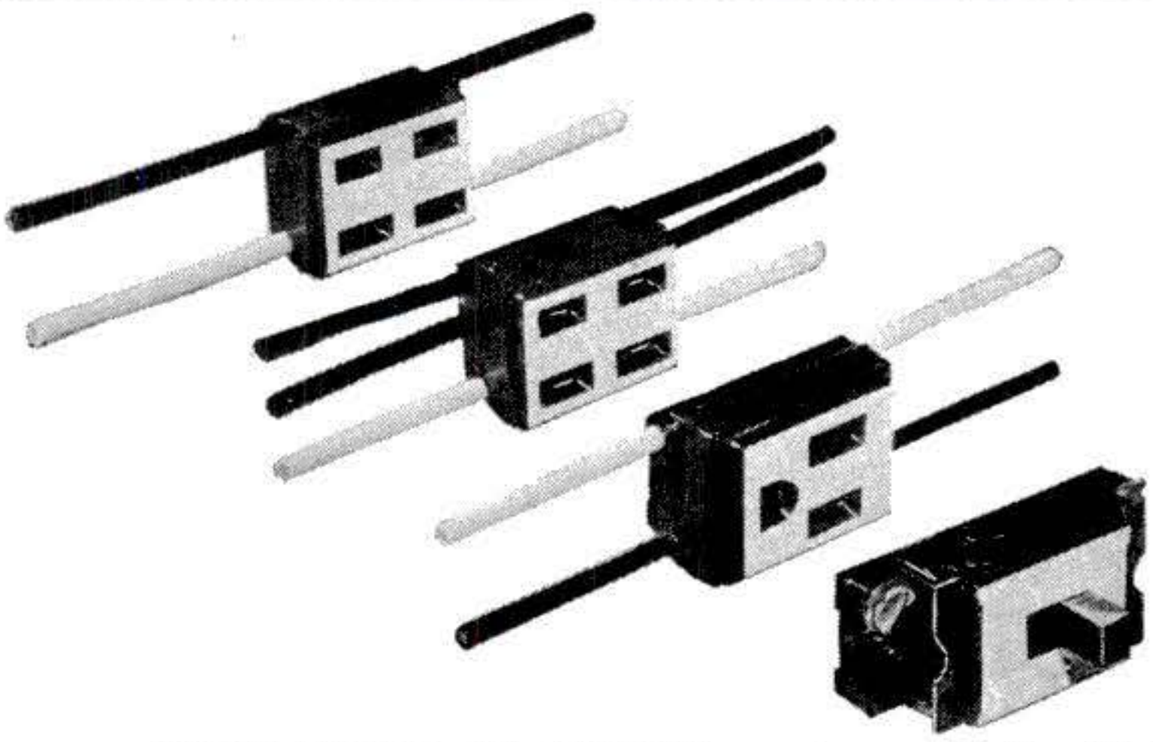
HOW YOU INSTALL THE RECEPTACLES



YOU BUY RECEPTACLES in sets of three, molded into 12″ strip. These plug into plain sections, can be inserted wherever you want outlets. The strips cost about $1 each.



CLIP-ON RECEPTACLES with connector prongs can be fastened to strip anywhere you want. You can get a fused outlet (at top) for about $1.50, a standard type (at bottom) for 60 cents.



THREE TYPES OF OUTLETS and a switch all fit in prepunched holes in the channels. Receptacles are (left to right): standard duplex, switch-controlled type, grounded type.

surface wiring for about the same cost as ordinary wiring installed by a licensed electrician.

The plug-in strips are rigid plastic, each 12″ long. The starting section plugs into any outlet; each succeeding section plugs into the end of the one ahead of it.

Where you wish to have outlets, you insert a section that has receptacles molded into the strip. In between, you use plain spacer strips to carry current.

This type of wiring is called "nonmetallic surface extension." Its heavy-duty No. 12 wires will safely handle a full circuit load; an ordinary extension cord won't.

Multi-outlet strip is a similar type of surface extension, but has no fixed outlets built into it. It's a flat, ribbon-like flexible plastic strip with No. 12 wire embedded under a lip at each edge. You put up the strip first, then clip separate receptacles into it wherever you want them. Prongs on the clip contact the wires. You buy only the outlets you need. Later you can add more or rearrange the ones you have.

This type of strip does not plug into the wall like the rigid type. The starting end is wired permanently into the existing wall box.

Both types of plastic wiring look best if kept low—either on or just above the baseboard. Run vertically up a wall, they may become conspicuous.

The third type resembles the old raceway wiring. It is a little more expensive and harder to install than the other new surface types. But it has a number of special features. The wires run inside a slim metal channel capped by a snap-in cover plate. Outlets, switches and light fixtures can be mounted right in the channel. If you want to change them later, you just pry off the cover plate to expose the wires.

You can also add extra circuits depending on the type of raceway you buy. Several sizes are available, some holding up to five or more separate two-wire circuits. The biggest channels are expensive and you probably won't need them, but it's a good idea to allow for at least one future circuit.

Which raceway for you? Not all makes of raceway offer the same features. So it's important to decide what you want before you buy. Most types come

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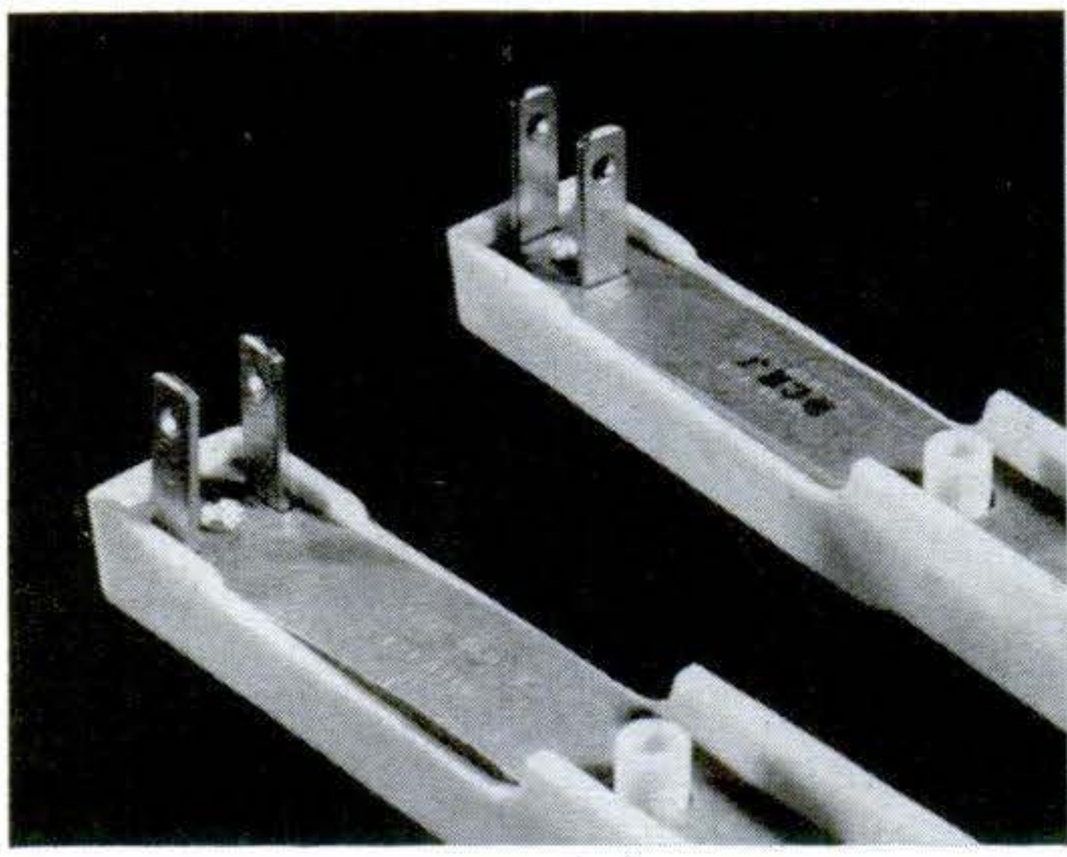
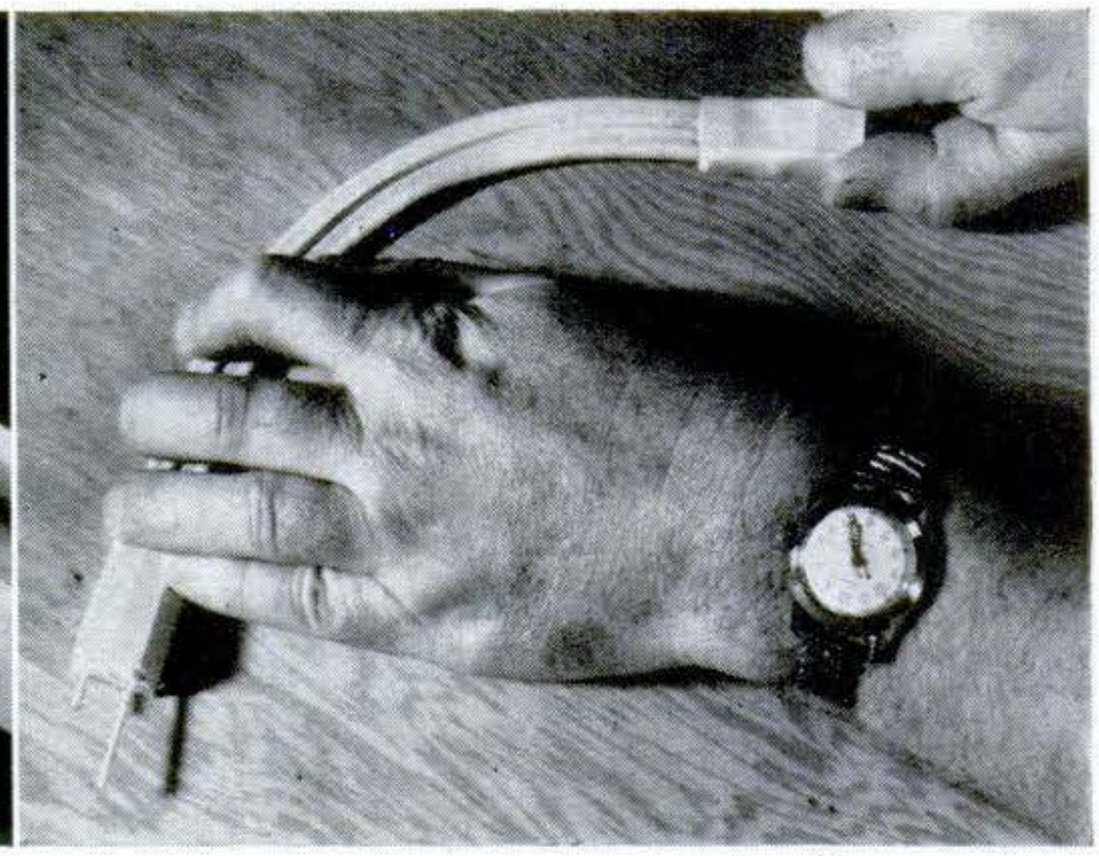
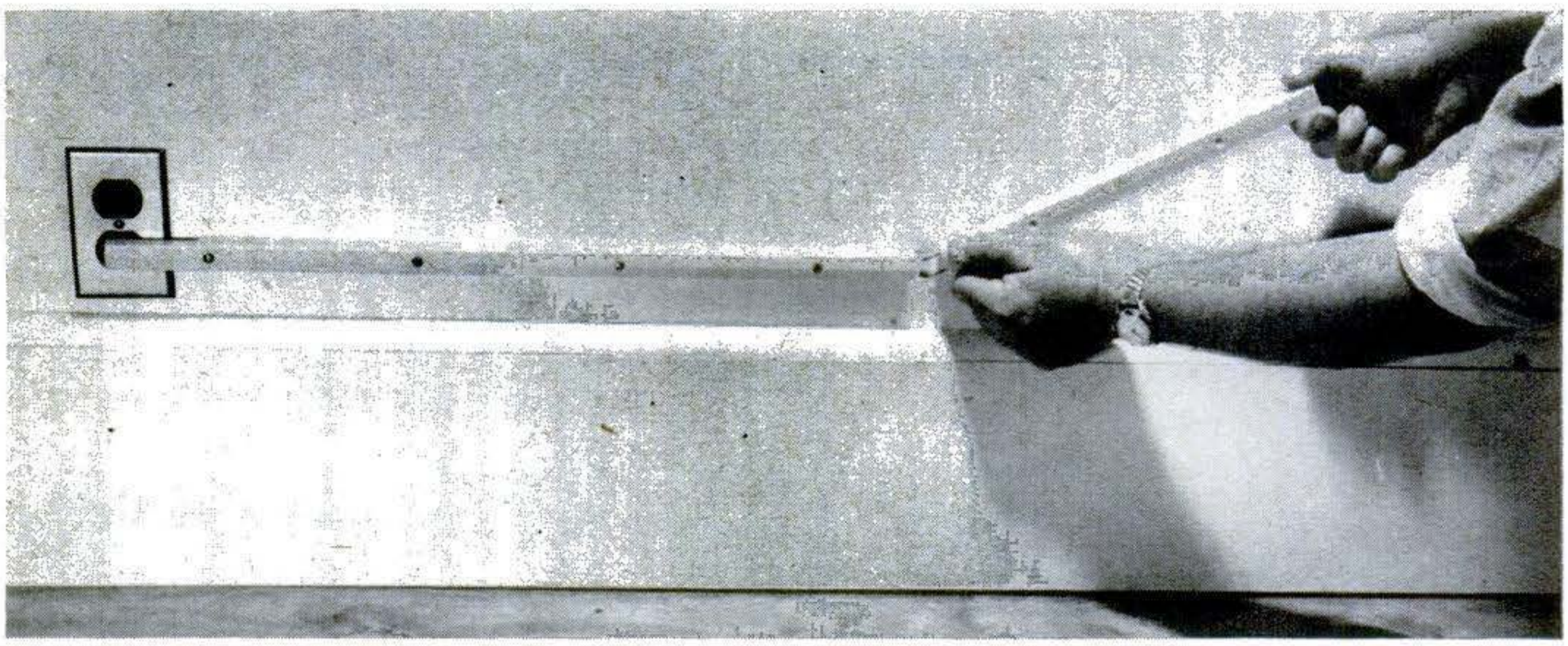
Plug-in strips require no wiring at all



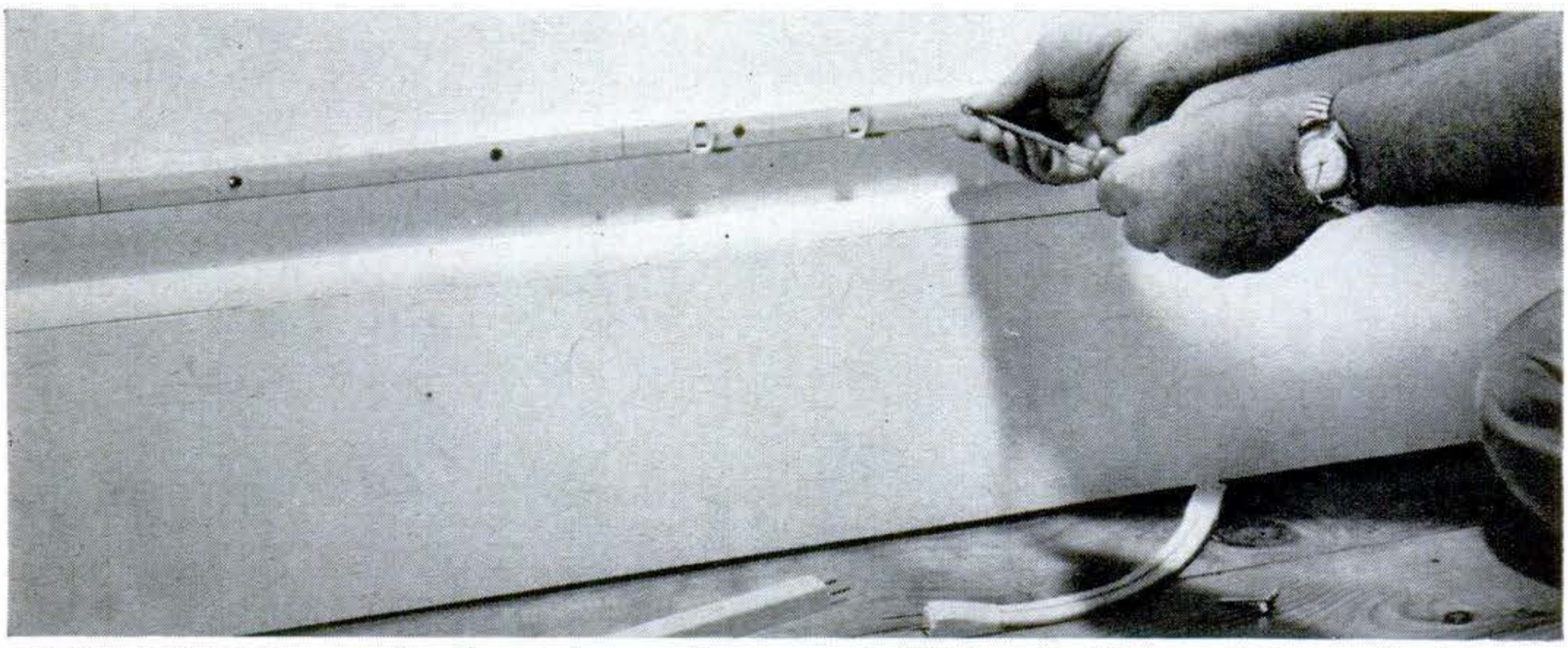
PRONGS ON THE ENDS of these starting strips plug into any existing outlet like an ordinary extension cord. You can buy them with the plugs turned either way so that strips can be run horizontally or vertically from the outlet.



FLEXIBLE SECTION is inserted wherever you want to turn a corner. It bends 90° either flatwise or edgewise. Uneven wire ends, caused by bending, are clipped off to equal length to form a plug that joins the next section.



RIGID PLASTIC STRIPS carry power along the wall from the existing outlet to where you want new receptacles. These are plain sections, each 12″ long, containing no outlets. Sections plug together, can be run any distance, and are mounted with screws to wall or baseboard.



OUTLET SECTIONS can be inserted anywhere between plain strips, usually every 2′ or 3′. This brand has three receptacles spaced along each 12″ length. If the existing outlet happens to be in the middle of the wall, you can run separate strips from it in both directions.

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in 5′ or 6′ sections, which you hacksaw to the length you need.

You can use metal raceway as a baseboard itself, eliminating wood trim. If it touches the floor, however, you'll need a special wide type—somewhat costlier—that raises the outlets to the required legal distance above the floor. You can also get a rounded metal cap strip that clips to the top of a raceway. This gives the neat appearance of quarter-round molding and can also be used to house low-voltage wiring for doorbells, hi-fi systems and telephones.

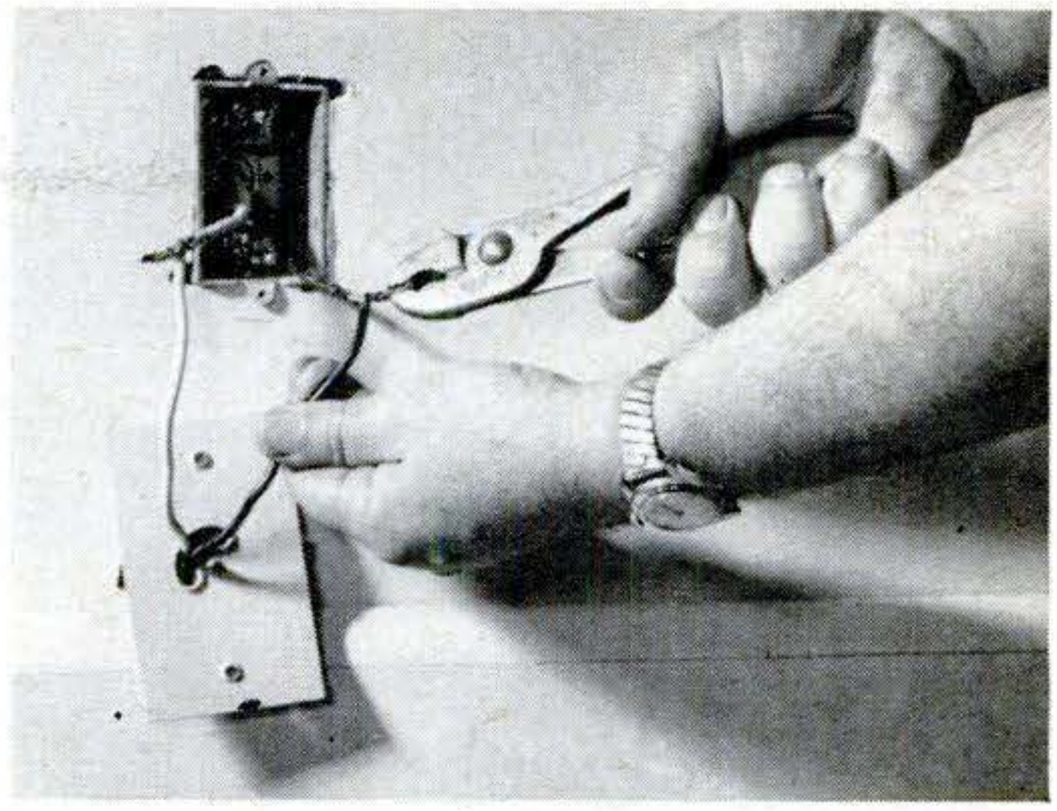
Raceway is wired by making a permanent connection at one end to an existing wall box. The outlets come pre-wired in long strings, eliminating connections between the receptacles. You can buy them spaced from 3″ to more than 5′ apart. In addition to standard outlets, you can buy double receptacles wired so that one half is always on, while the other half can be controlled from a switch. You can also get the newer three-way grounded receptacles recommended for power tools and appliances.

Where to use the strips. The nonmetallic types (both rigid and flexible plastic) can be run only in *exposed, dry areas.* You cannot use them in basements, attics, garages or other possibly damp locations, and you cannot run them through or inside a wall. They must not be allowed to touch the floor or come any closer than 2″ above the floor. In mounting them, attach them only to wood or plaster surfaces, away from all metal except for the one connection at the wall box.

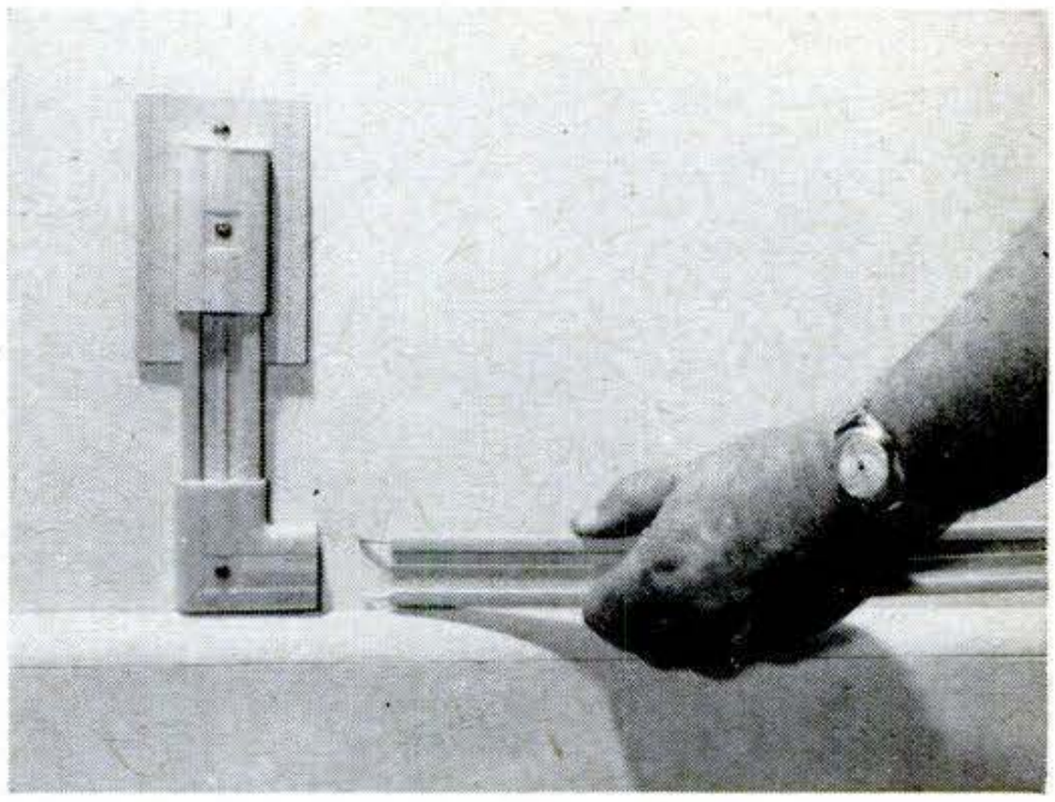
Metal raceway is the only type of outlet strip that can be used in basements, attics or other unfinished areas. Because of its metal channel, it provides a continuous ground connection back to the fuse box, as the other, nonmetallic strips do not. Even raceway, however, should be kept away from any excessively damp areas, such as wet cellar floors or walls. In basements, workshops, kitchens and utility rooms it should also be fitted with the three-way grounded type of receptacles.

None of the strips should be placed near excessively hot locations, either. If you have baseboard heaters, don't mount the strips directly against them. Fasten a 1″-by-2″ wood spacer strip above

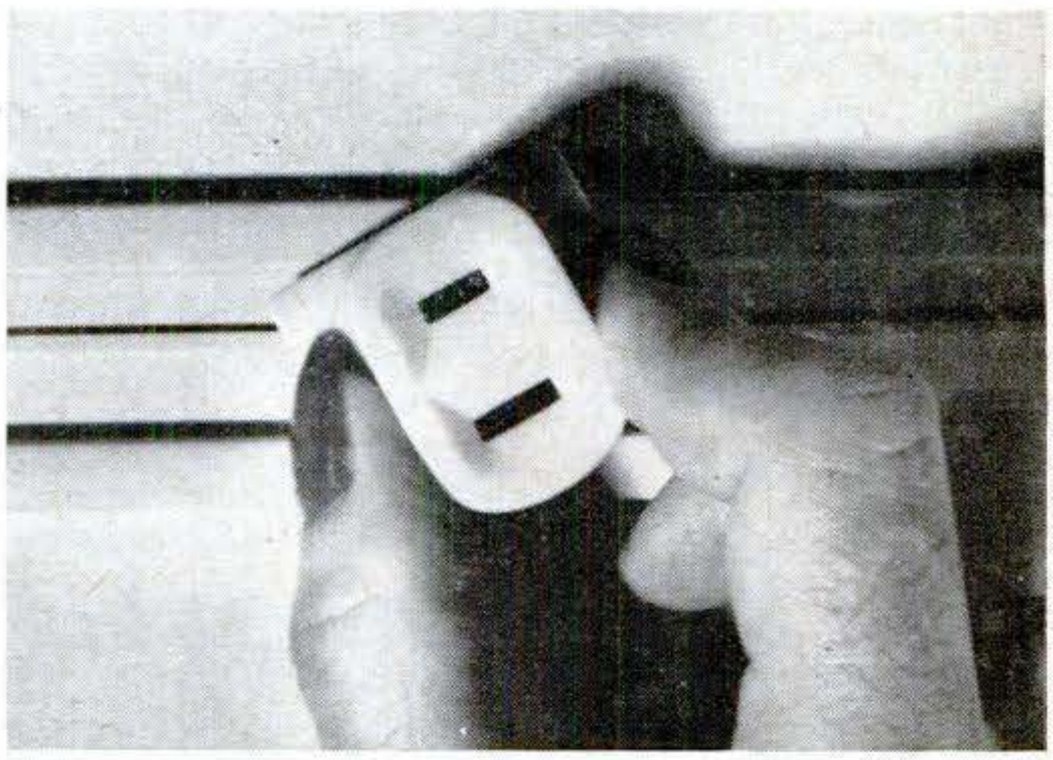
Flexible strips need only one connection



ADAPTER PLATE is first connected to existing wires in outlet box after power has been shut off and original receptacle has been removed. Wires must be soldered and taped, or joined by solderless connectors, in the approved way.



ONCE PLATE IS ON WALL, plastic strip plugs into it, requiring no further wiring. Here a short length leads down to angle connector, then strip runs along baseboard. Wires are bared ½″ at ends to form connector plugs.



OUTLETS CLIP ON wherever you want them, making contact with wires in plastic strip. Receptacles are polarized, can be inserted only one way. This strip has off-center ridge, preventing accidental reversal of wires.

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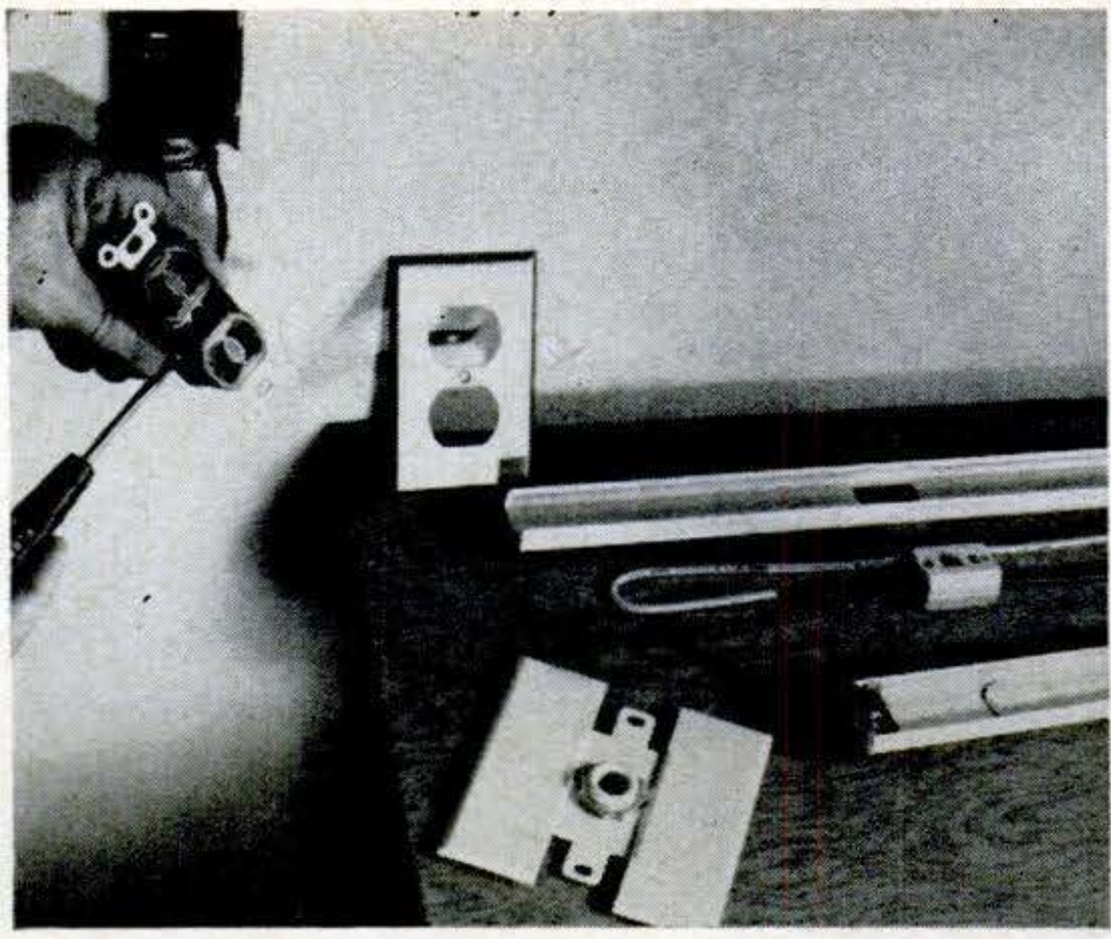
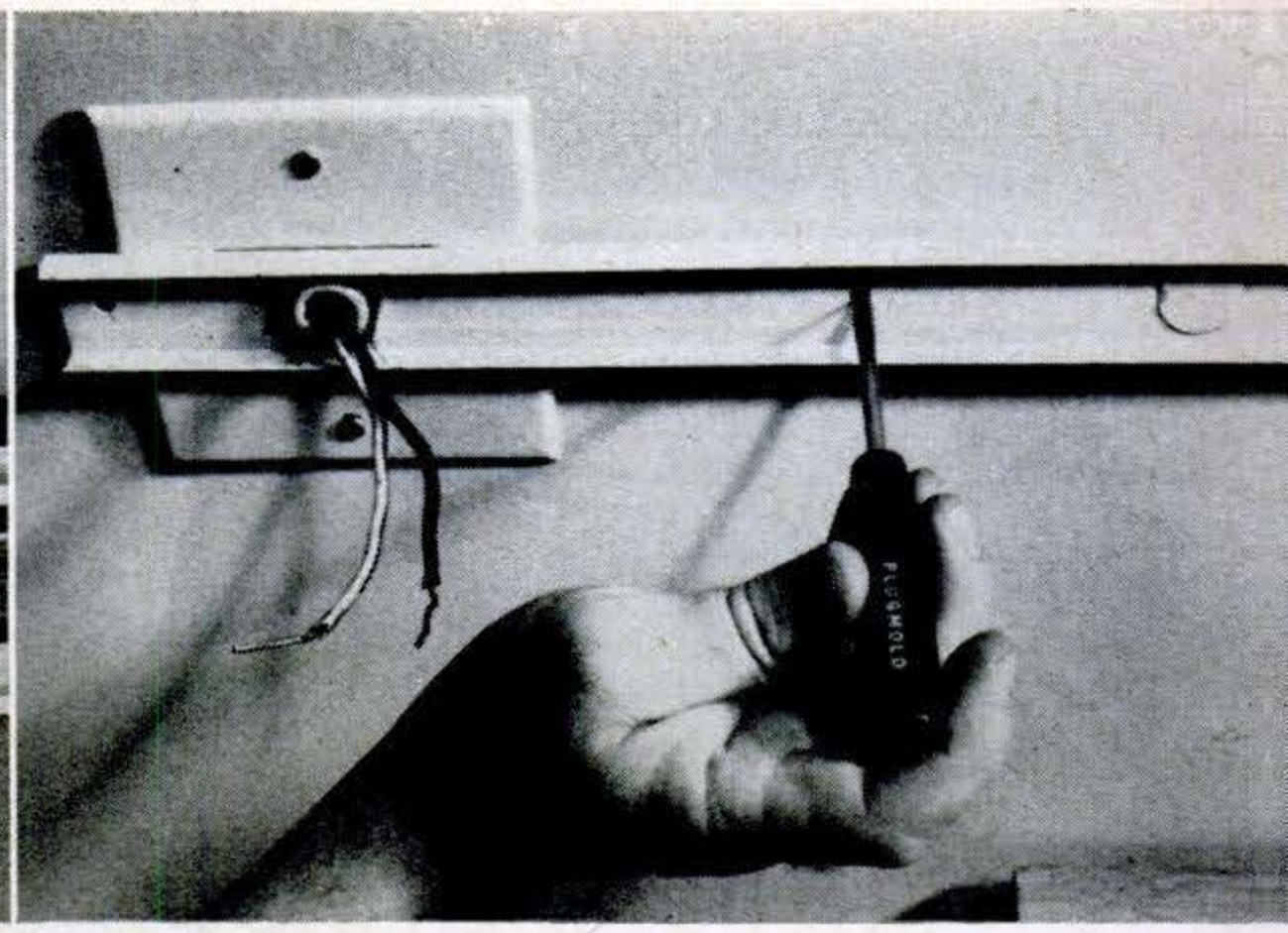
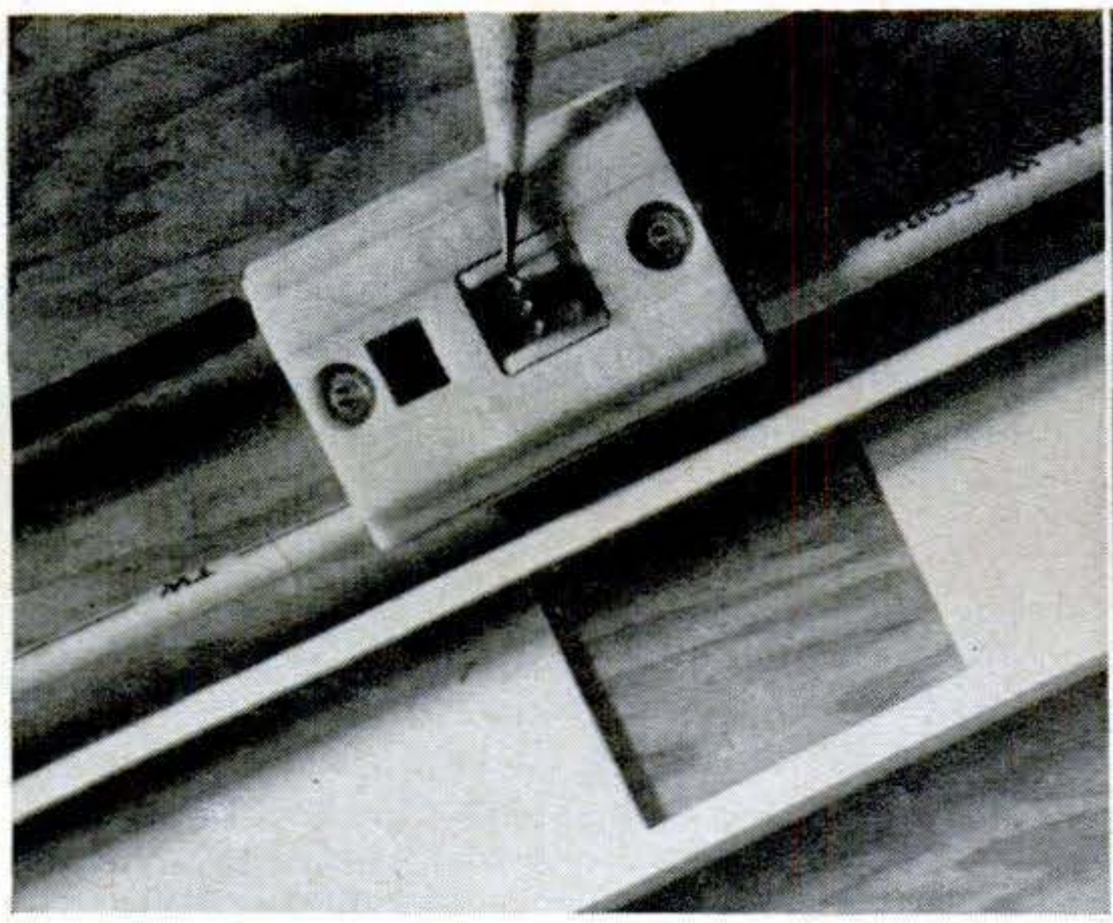


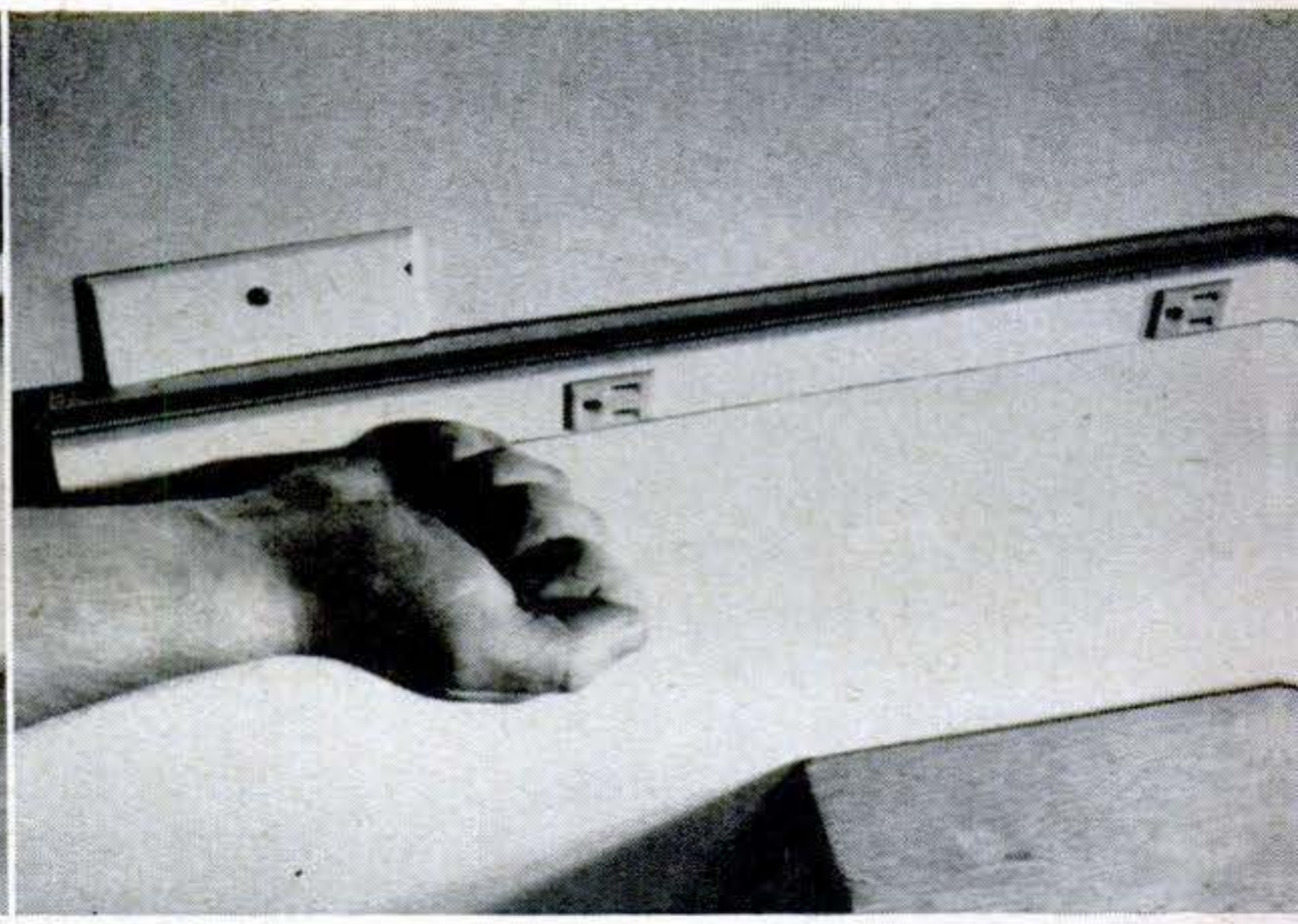


How metal raceway is run along the wall

TO START A STRIP, power is shut off, and old outlet is removed from wall box. Existing wires are then fed out hole in new adapter plate (on table), and plate is screwed to box.

METAL CHANNEL is attached to wall plate by opening knockout hole in back and bolting channel to threaded bushing on plate. Channel is screwed to wall through predrilled holes.



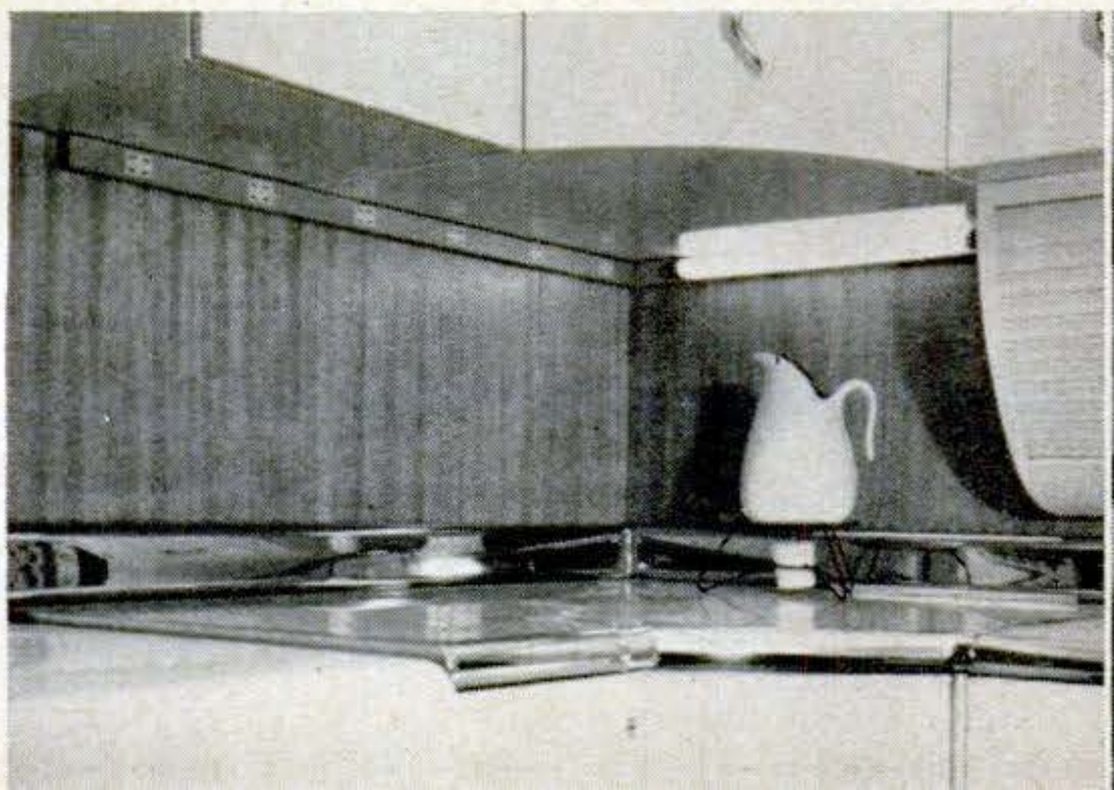


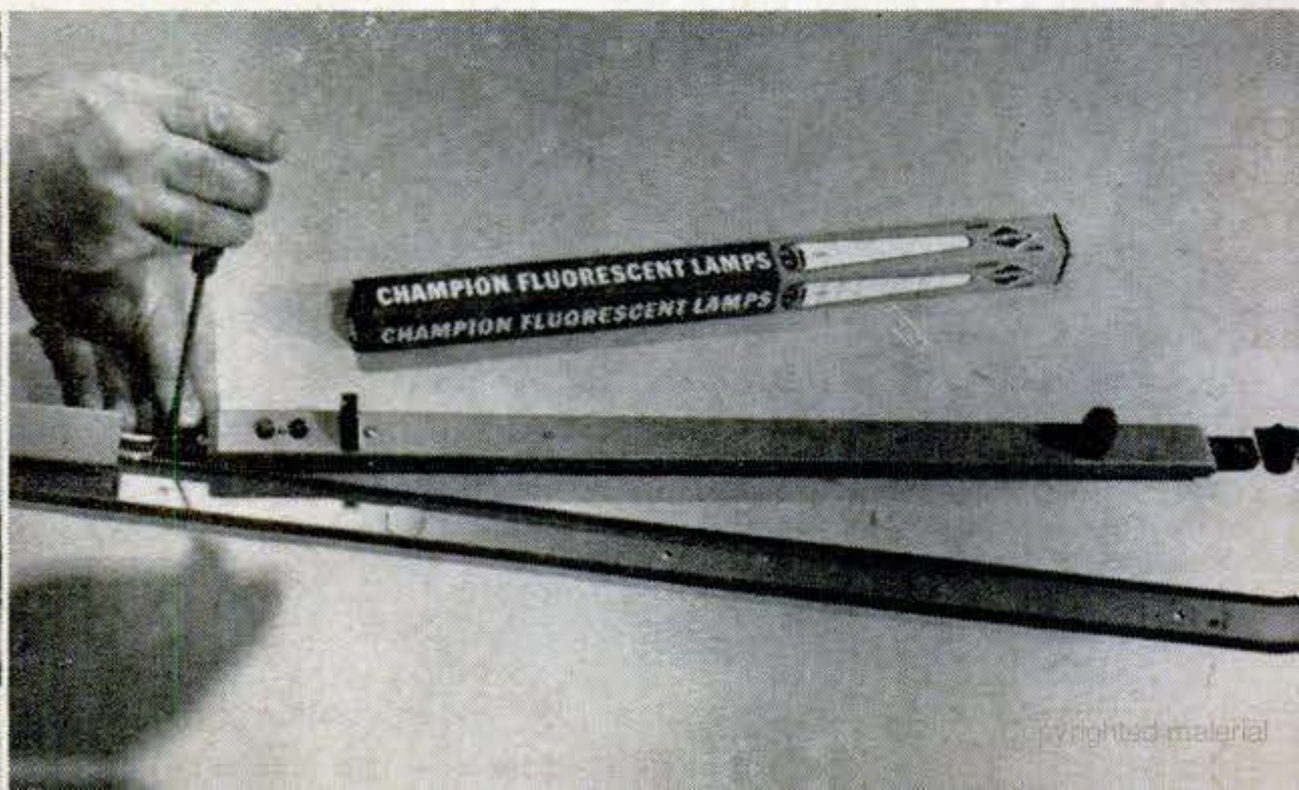
THIS GROUNDED RECEPTACLE has a spring-metal prong on back that presses against metal channel and makes ground connection back to fuse box. Outlet has three holes to take either regular two-prong plugs or new three-prong plugs.

COVER STRIP snaps in place over channel on wall. Start at one end and work toward other, striking cover smartly with fist. Wiring can now be painted to match wall. The type shown here also comes in several other sizes.

You can even add a light to your raceway

PRE-WIRED FLUORESCENT FIXTURES provide convenient work light, along with outlets for appliances. To install one, a section of the metal cover is hacksawed out and fixture fits over channel. Where raceway is used for lighting in rooms having appliance circuits, such as kitchens, it must be connected to some circuit other than the regular appliance circuits.





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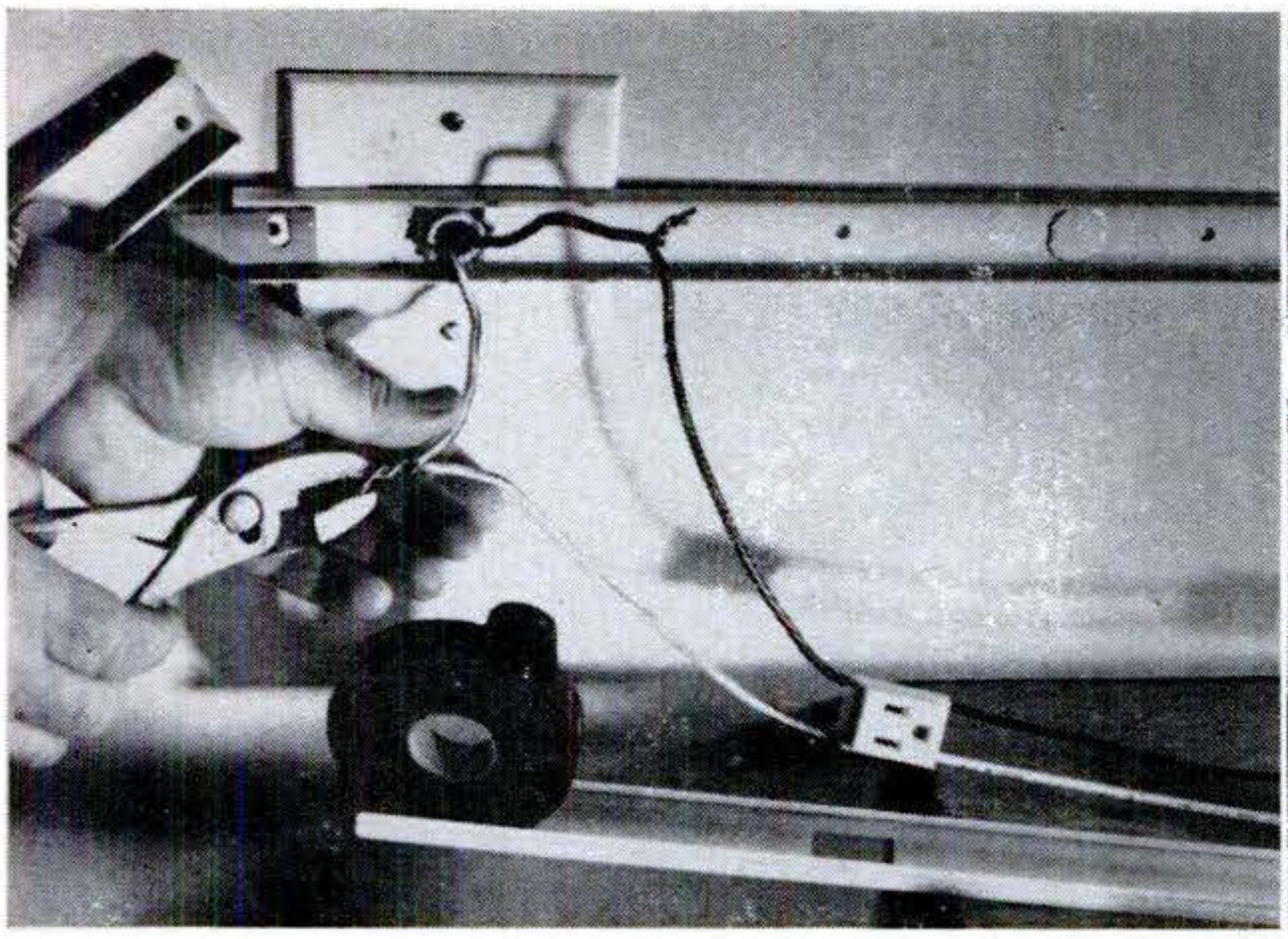
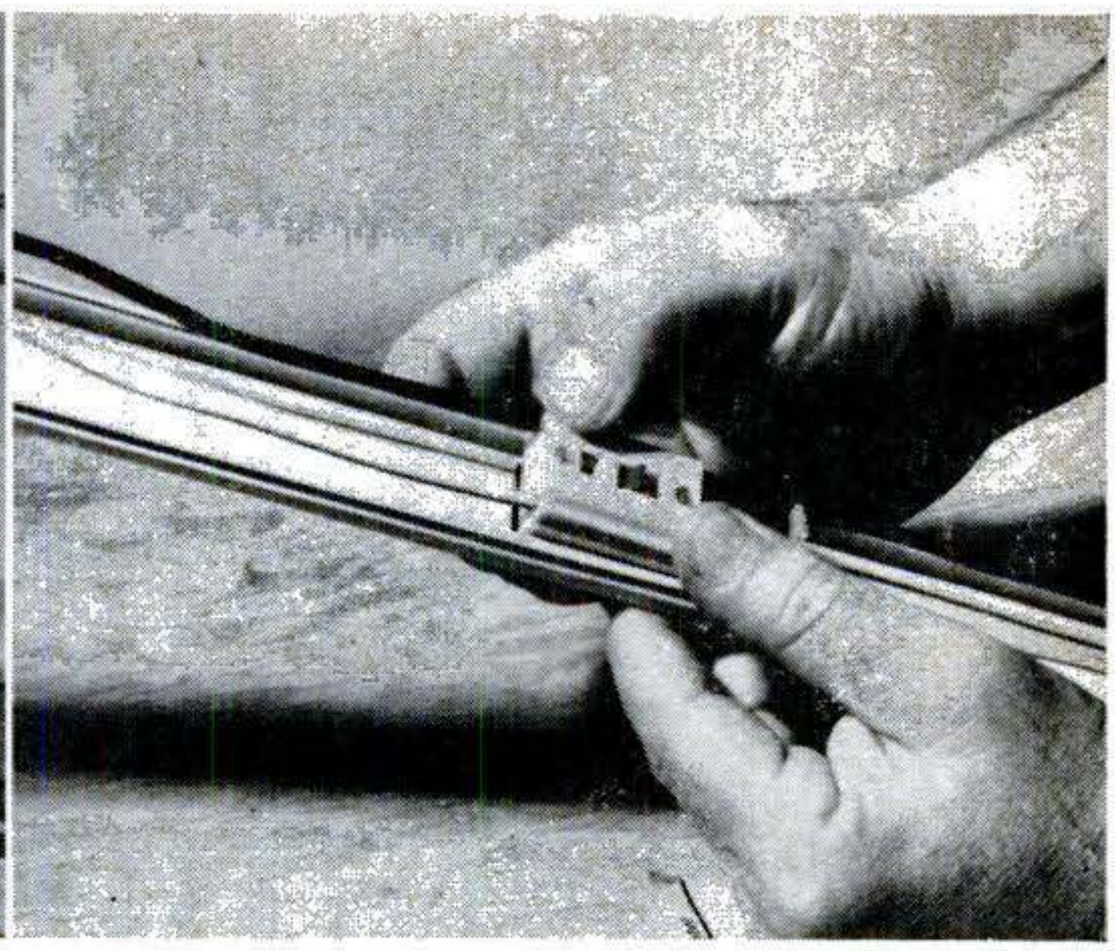
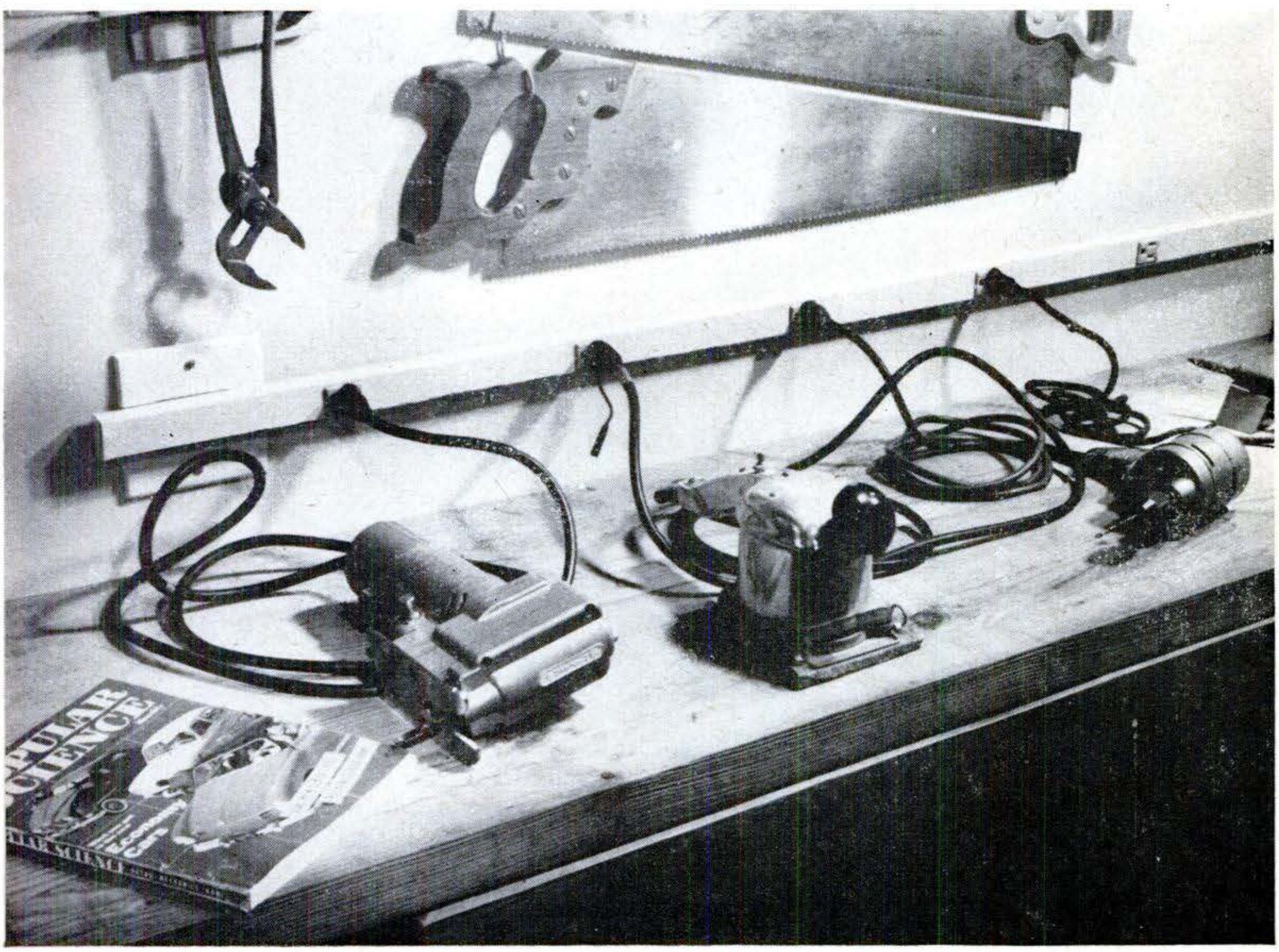


PRE-WIRED OUTLETS come in long strings like this. Only two connections are necessary to join end of strip to existing wires from wall box. Wires are twisted tightly together—white to white, black to black—then soldered and taped, or capped with solderless connectors.



OUTLETS SNAP INTO OPENINGS already provided in metal cover strip. In some other types, outlets are fastened in the channel first and the metal cover snaps over them. Unused wires at end of outlet string should be carefully wrapped with plastic electrician's tape.



Multiple outlet strips can speed your shopwork

NO LONG, TANGLED EXTENSION CORDS are needed with a setup like this. You can keep several tools plugged in at a time, ready for quick use, with no plugging-unplugging nuisance. But remember—you get more convenience, not more capacity. Never put more than normal load on a circuit or the fuse may blow. Receptacles here are grounded type, recommended for tools.

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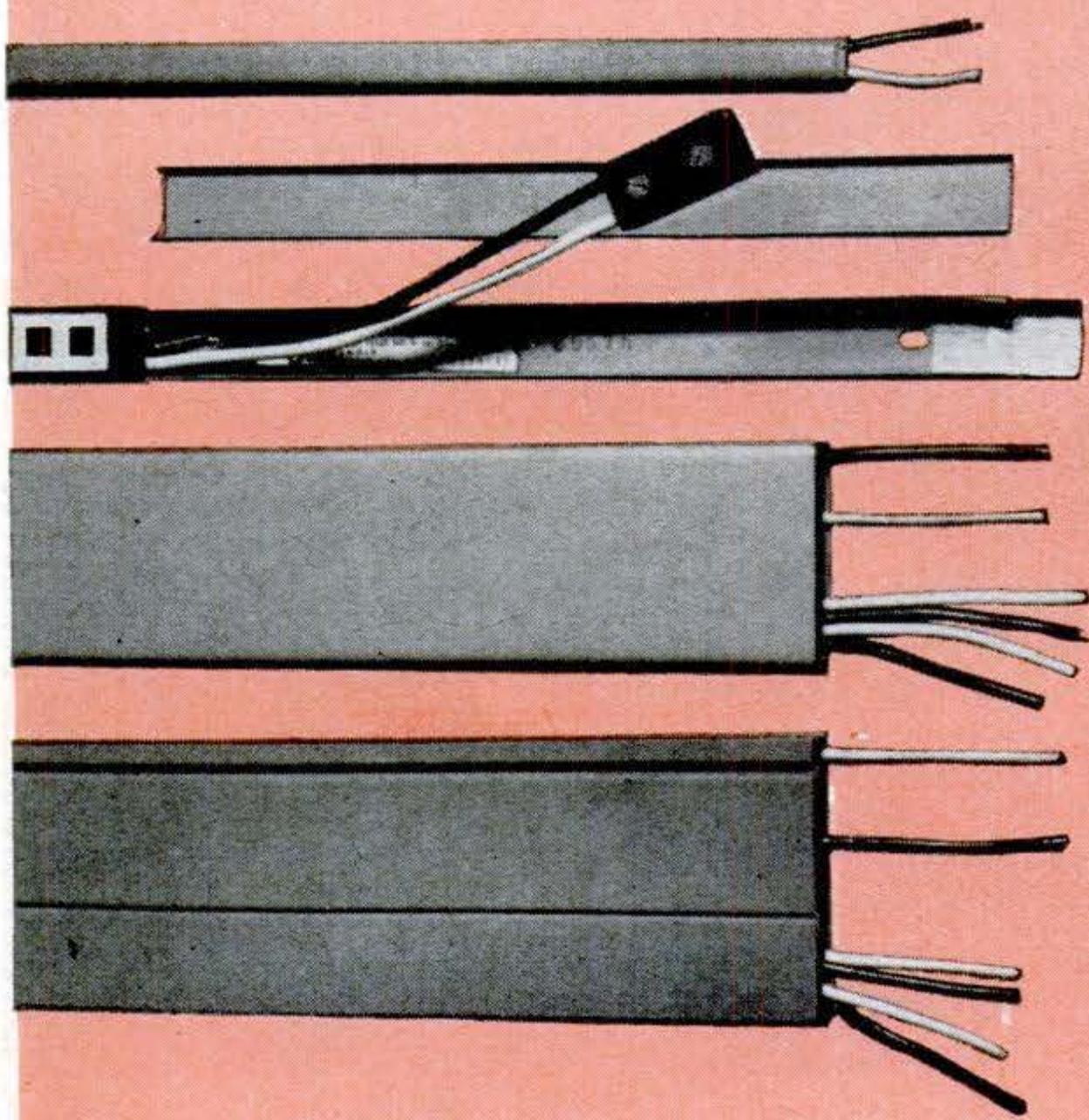
How you can use different sizes of metal raceway



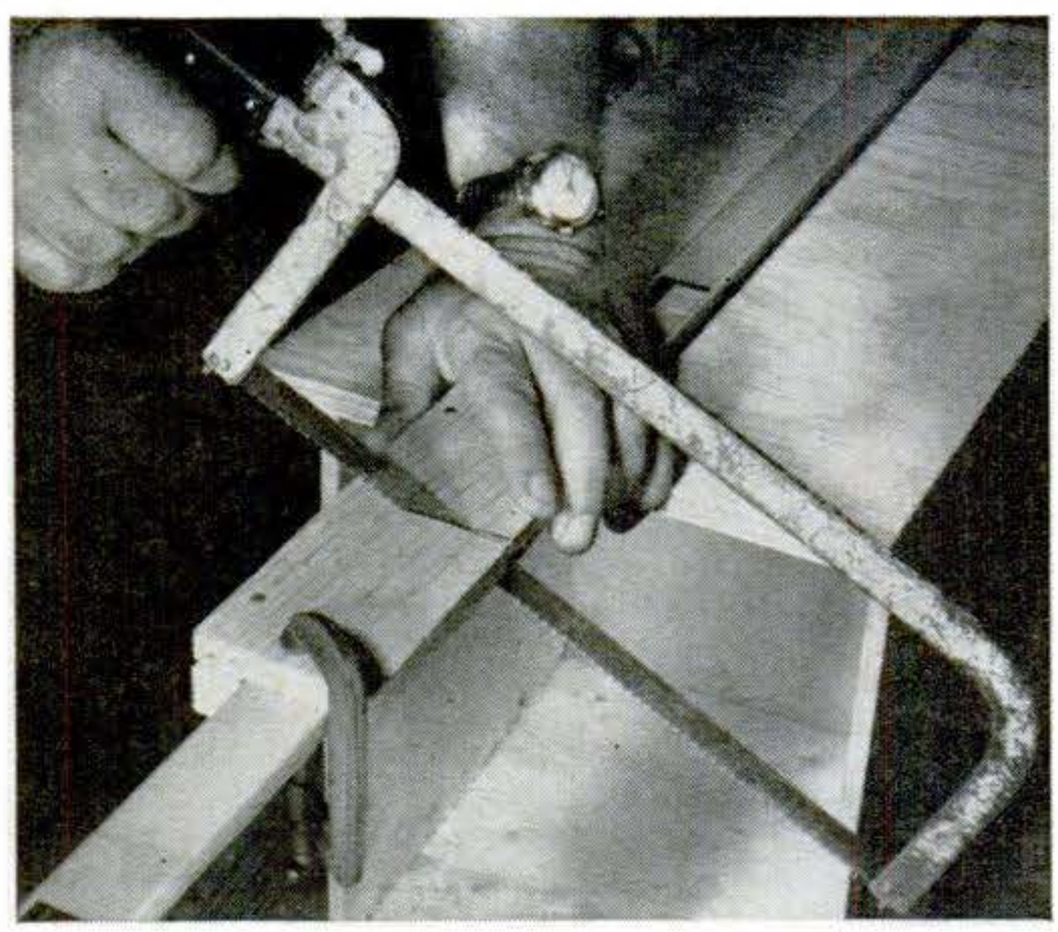
NARROW ½" TYPE carries only two wires, has no provision for outlets, but can be used to run wires from one point to another. It costs about 15 cents a foot.

MOST COMMON TYPE, about 1" wide, houses one strip of outlets, but does not have room for extra circuits. In the pre-wired type shown, connector blocks join sections without requiring wiring. It costs about $1 a foot.

LARGE TYPES, 2" to 3" wide, can handle up to 10 or more No. 12 wires as well as outlets. You need this type if you run the channel against the floor, in order to raise receptacles to proper height. They cost a little more than $1 a foot.

the heaters, flat side against the wall, then run the wires above the wood.

How many outlets? There's no legal limit to the number of outlets you can add so long as each strip stays in the same room where it starts. You cannot run a strip from one room into another room through the wall.



TO GET A NEAT, SQUARE CUT on metal raceway, clamp on a wood strip with a guide slot for the hacksaw. For a fast, smooth cut, use a fine-tooth blade—either 32 teeth per inch or a special 40-tooth blade made for the job.

There's no point to adding more outlets than you can conveniently use—they're one of the most expensive parts of the deal and will just run up the cost. For baseboard use, an outlet every 30" to 60" is adequate. For a kitchen counter or workbench, you may want one every 12" or less.

It's also wise to remember that adding outlets does *not* increase the current-handling capacity of the original branch circuit. You must take care not to turn on any more lights or appliances at the same time than you normally would.

In some homes, the outlets in each room may be fed by two circuits instead of one. If you tap into only one existing wall box, you are thus likely to waste one circuit while overloading the other. In this case, it's best to split your wiring, running two strips from two separate wall boxes, one on each circuit.

The plastic strips do not provide for switch controls, but there's a trick you can frequently use to get a switched circuit. Often one outlet in each room is wired to a wall switch. If you connect the strip to this box, all of your new outlets will also be controlled by the same switch. END

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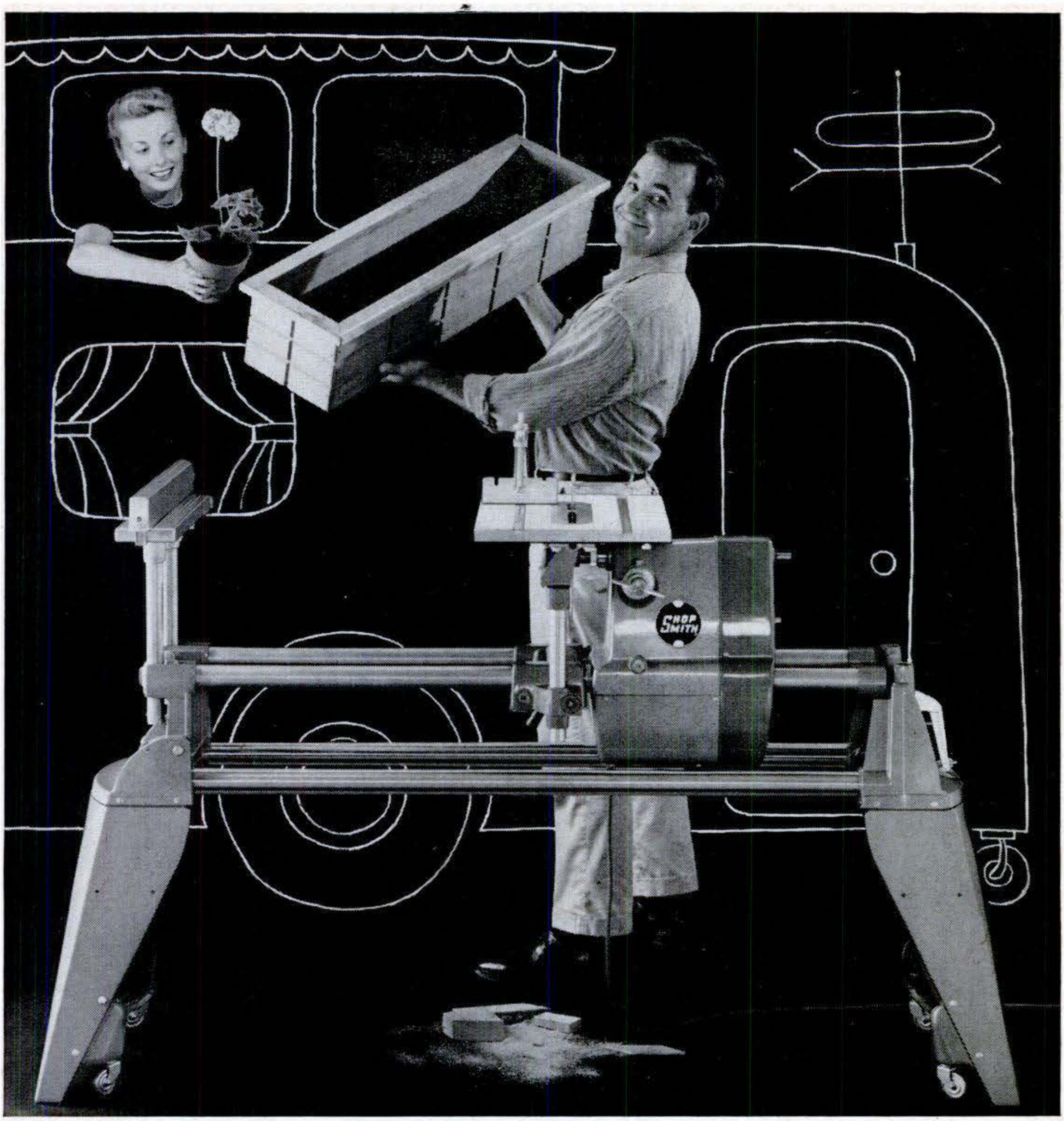

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New! Kodak Pony II Camera

Makes 35mm color slides faster, easier than ever. Only $26.75

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Here's why: You make only *one setting* for correct exposure—and a guide on the camera tells you how. Focusing is just as easy. You dial the kind of picture you want to take—"Close-up," "Group," or "Scene." Then you frame the picture the way you like it in the big view-finder—and press the button.

Even if you've never taken a picture before, you can learn everything you need to know about the Kodak Pony II Camera in a matter of minutes. It loads without threading, cocks the shutter automatically, counts each exposure made, keeps you from making "double exposures." In short, it handles so smoothly that all you have to think about is the fun of taking pictures!

Ask your photo dealer about the Pony II's fast *f*/3.9 lens and remarkable operating ease. And remember, you can own a Kodak Pony II Camera for as little as $2.70 down.

New Exposure Value Settings

All four new Kodak cameras described here are calibrated with exposure value numbers which make picture-taking faster . . . easier than ever. A guide on the camera tells you which number to use to *set everything* for the right exposure.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

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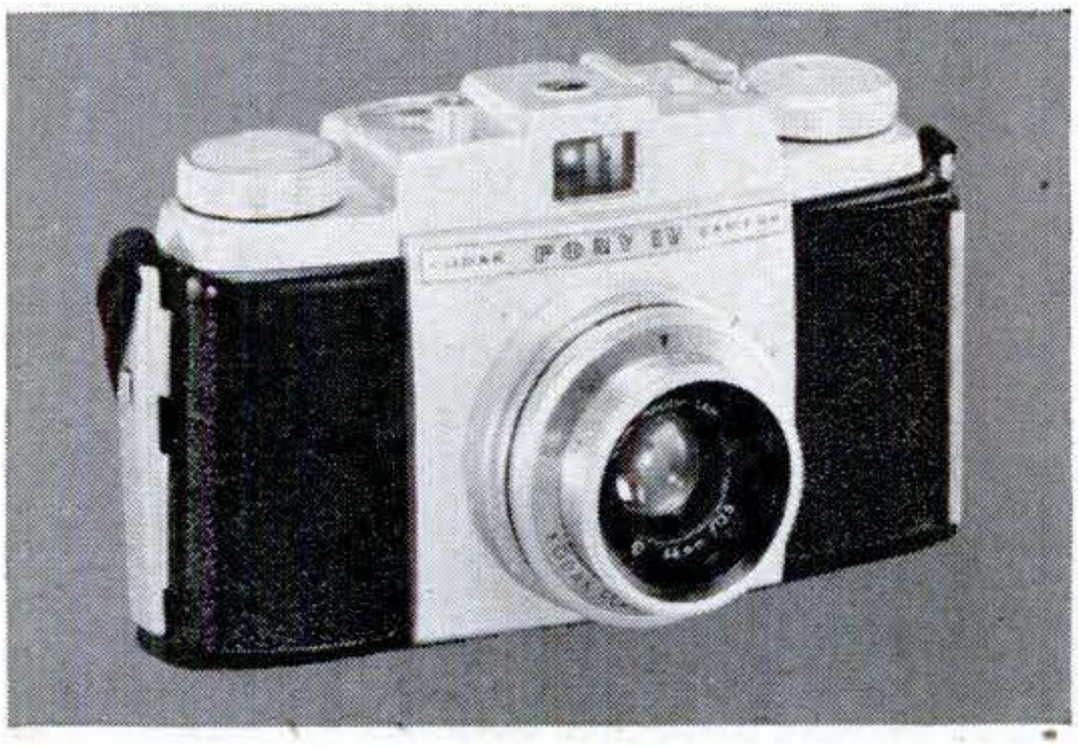
New!

KODAK PONY IV CAMERA

has the deluxe features 35mm fans asked for!



Here are some of the *plus* features that make this the finest Pony ever built . . .

Exposure settings are ultrafast. For each picture situation, a guide on the camera tells you which *exposure value number* to use. Simply match this number with the camera settings—and shoot! (Kodak Pony IV Camera has new *exposure value scale* markings as well as conventional shutter-speed and lens-opening settings.)

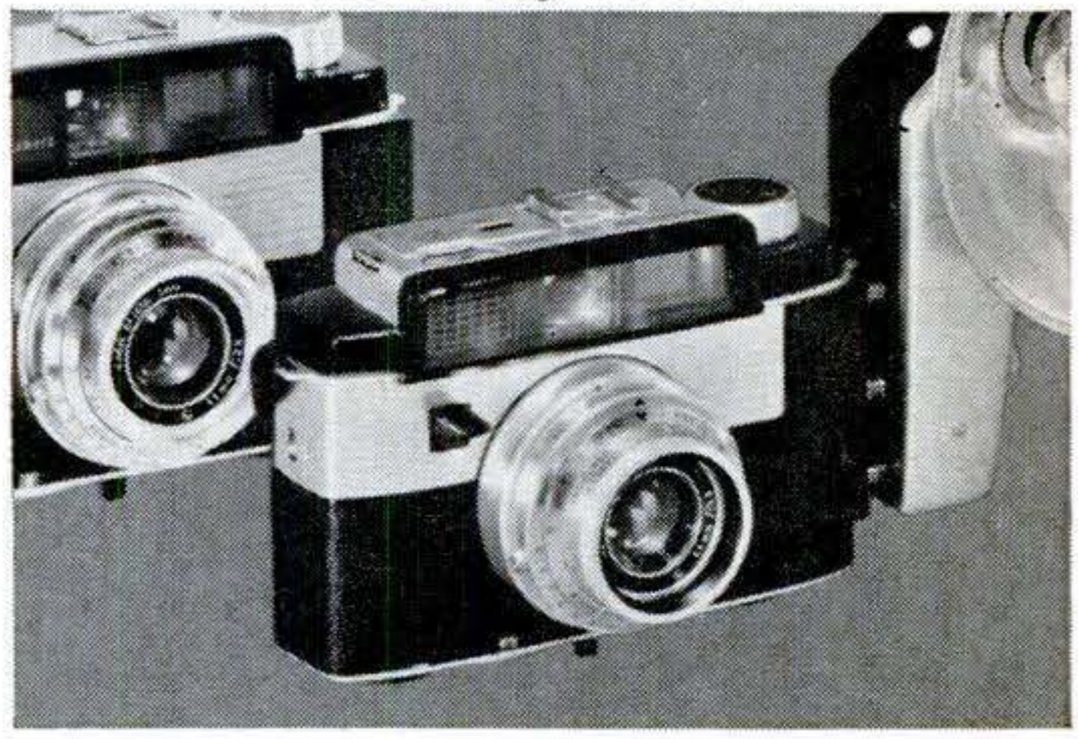
Focusing is equally fast. You can dial for "Close-ups," "Groups," "Scenes,"—or focus by scale from 2½ feet to infinity. Other Pony IV features: automatic double exposure prevention *plus* a release for intentional multiple exposures; direct body-contact flasholder fittings *plus* a handy accessory clip on top of the camera. And to give you really sharp pictures, the Pony IV has a fast, Lumenized *f*/3.5 Kodak Anastar Lens.

New Kodak Pony IV Camera, $39.95, or as little as $4 down.

New!

KODAK SIGNET 50 CAMERA

measures the light for every shot!



Precision photography has never been simpler! With the Kodak Signet 50 Camera (right) a photoelectric meter tells you the right exposure for a subject. All you do is read the number on the meter, set the same number on the camera—and shoot! An exceptionally fine *f*/2.8 lens and an 8-speed Kodak Synchro Shutter let you take top-quality pictures anywhere, any time.

Your photo dealer will gladly show you the new and automatic features that make Signet 50 the fastest, surest operating 35mm camera Kodak has ever built. You can own a beautifully styled Kodak Signet 50 Camera complete with flasholder and two reflectors for $82.50, or as little as $8.25 down.

Kodak Signet 30 Camera (left) is identical with the Kodak Signet 50 Camera except that it has no built-in light meter, and does not come equipped with flasholder. $55 or as little as $5.50 down.

Ask your photo dealer about these other fine Kodak 35mm Cameras...

Kodak Signet 40 Camera. Precision camera with rangefinder and handy dual-reflector flash system, $74

Kodak Retina IIIc Camera. Has coupled rangefinder, ultrafast *f*/2 lens, built-in photoelectric meter. $175

Kodak Retina IIc Camera. Has *f*/2.8 lens, no exposure meter. $132

Prices are list, include Federal Tax, and are subject to change without notice.

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TRADE MARK

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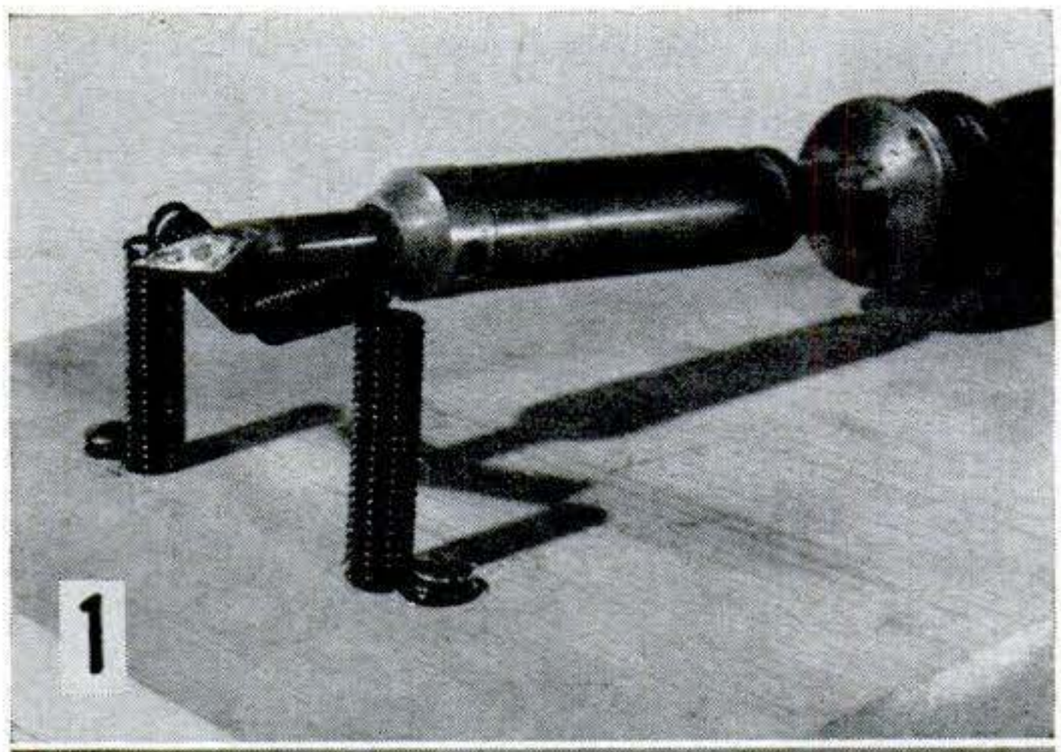
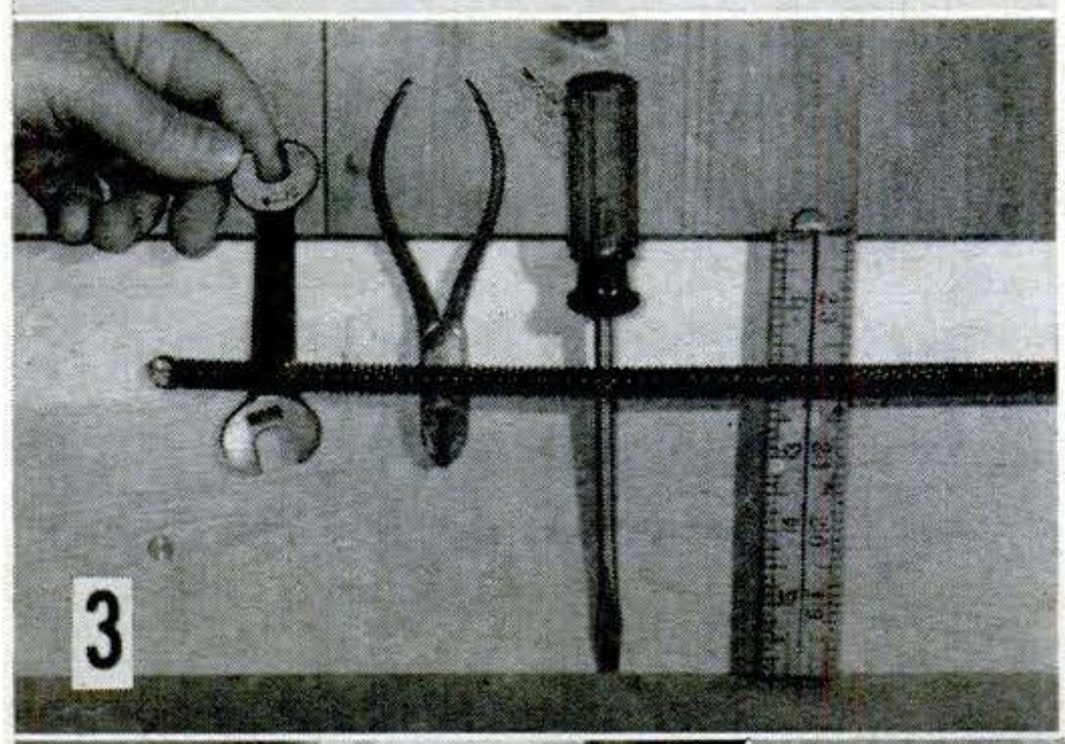
6 USES FOR Door Springs





1 Soldering-Iron Rest. Open the coils at three places with a screwdriver and bend the spring into the shape of an "M". Bend outward one turn at the bottom of each leg and screw the spring to the bench.

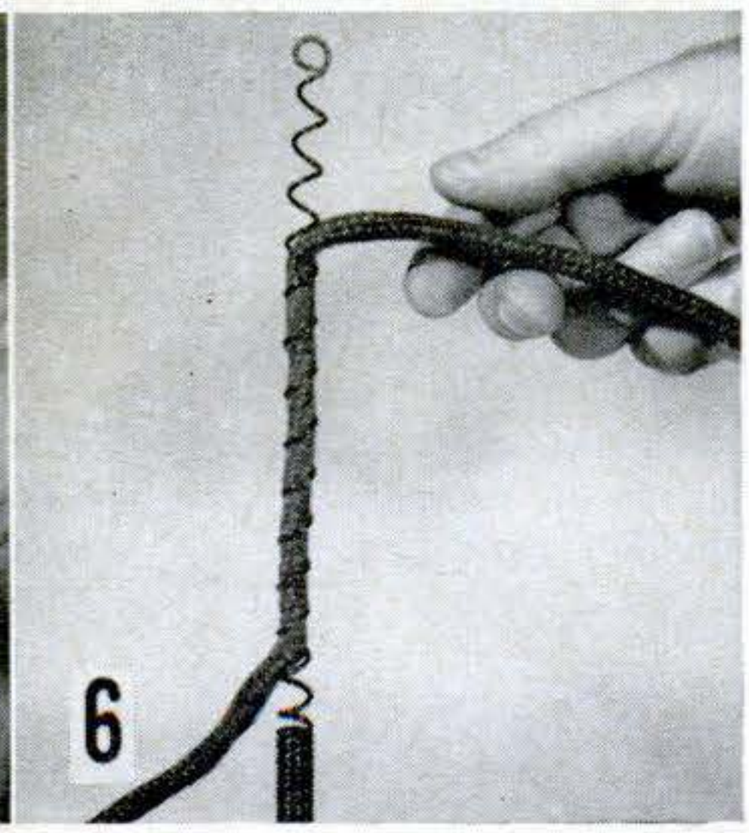
2 Hot-Plate Holder. Bolt the ends together to form a circular rest that will prevent heat damage to a table top. A spring bent into a rectangle or triangle will hold dishes of various sizes.

3 Tool Rack. Stretch the spring taut and screw the ends to the backboard of the workbench to hold small tools in place. Staple the spring at several points to create pockets. Inside a cabinet door, a stretched spring will hold pan lids.

4 Paintbrush Cleaner. Stretch a short piece of spring and clip it over the edges of the solvent can. The open coils will separate the bristles, loosen the paint and allow the solvent to penetrate.

5 Door Pull. An unusual pull for a cabinet door or drawer can be made by screwing down the ends of a short piece of door spring. Space the screws closer than the spring's length to make it bow outward in a curve at the middle.

6 Appliance-Cord Support. Screw a spring to the bench or work table so that it stands upright. Stretch open the top half and wind the cord around the coils to put it inside the spring.



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It's tough enough when a repairman can see the trouble, but it's a black day when he tangles with:

The Strange Case of the TV Phantoms

By Art Margolis

I BACKED slowly toward the door. Whatever the bartender was holding under the bar looked heavy and ominous. He came toward me . . .

You get to expect things like this when you're in the TV-repair business as long as I've been, but this was worse than usual. It was another case of the TV Phantoms, as I call them. These are troubles that have nothing to do with bad parts inside a TV set. They're caused by interference outside a set, and it often takes a detective as well as an electronics man to track them down. That's where trouble begins: Customers don't want excuses—they want results.

Here are five cases of phantom TV troubles I've had lately, including my brush with the burly bartender.

The Fee I Didn't Collect

ONE late afternoon I found myself answering a call in a run-down bar over in the tough part of town. The ex-prize-fighter bartender was mountainous.

"It's a brand-new TV and it's nuts," he growled. "The people keep jumping back and forth on the screen. The boys in here take one look and walk out. That ain't good for business, see?"

I ran the usual checks on the set. It

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was in perfect order. Yet every few seconds, the 17″ screen would be full, then the picture would suddenly shrink. As the picture lost size, the performers gave the impression of jumping.

"Snap it up, Mac," barked the bartender.

I timed the collapsing picture. It occurred every four seconds. Each time there was loss of horizontal sweep, vertical sweep, brilliance, contrast and audio. What could cause all this simultaneously? I applied the probes of my voltmeter to the wall socket. The line voltage was jumping from 117 down to 90, then back up to 117 every four seconds. Something was snatching voltage.

One by one I went through all the appliances in the bar and found no trouble. It was getting dark. The bartender moved menacingly toward me.

"Look, pal, the boys won't stand for no nonsense. You fix it fast."

Some of the "boys" slid off their bar stools and stood around me. In the near-darkness, I suddenly became aware of a flashing light that lit their faces with the eerie glow of a grade-B movie scene. There, across the street, was a mission house with a two-story-high sign that blinked the warning: "Save Your Soul."

I counted: 1 . . . 2 . . . 3 . . . 4. The sign went off. Exactly four seconds later, it flashed on again. At the same time, the TV performers started jumping.

I pointed. "There's your trouble. That sign pulls so much current that it drops the voltage in your set every time it flashes. The drop in voltage causes your picture to shrink. The wiring for this entire street is so old it can't supply enough power."

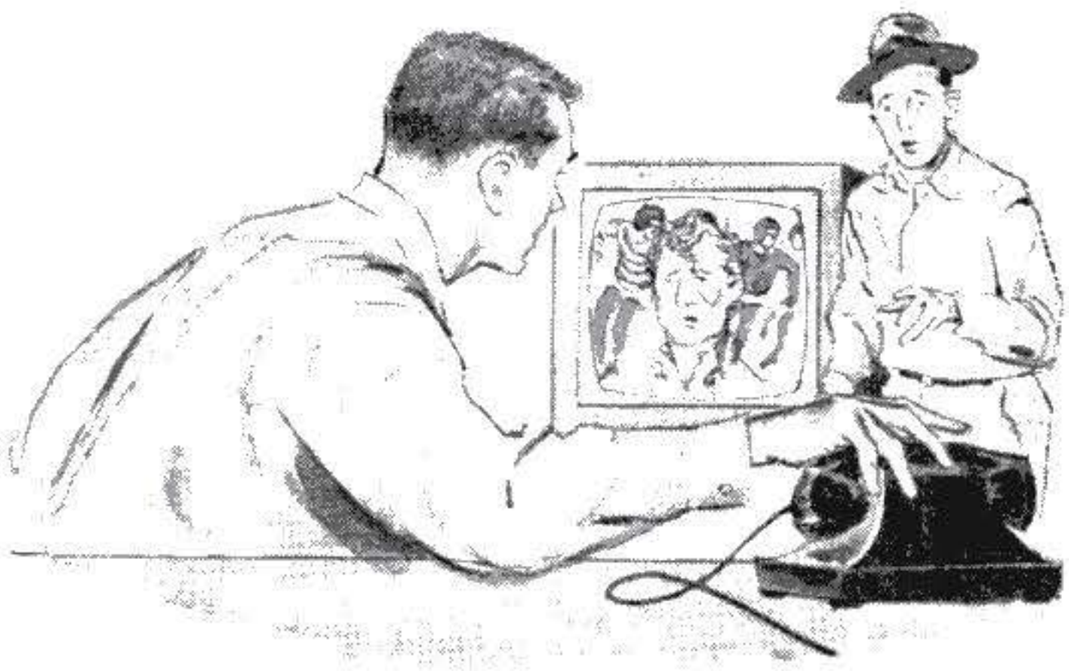
That stopped them for a minute, but I could see they weren't happy about the mission's sign spoiling the show.

"I can't fix the wiring," I told them, "but I can send a man from the power company who can."

I didn't wait for their answer. I headed for the door.

Couple of weeks later, my friend Jim at the power company called. "We fixed that bar job you told us about. Set works fine now. Bartender there, nice guy, says you never got your fee, says you can take it out in free drinks any time."

"Thanks, Jim," I said, "but I think that's one fee I won't bother to collect."



The Case of the TV Intruder

ONE quiet fall evening I was cleaning up the shop while my helper, young cousin Pete, was slouched on a stool watching a movie on TV. Suddenly he yelled, "My gosh, Art, look at this!"

I looked. Suddenly one of the actors disappeared and a snowy picture of roller skaters took his place. Then, just as suddenly, they were gone and the actor returned. This was on Channel 3.

I said to Pete, "Sit by the telephone. It's gonna start ringing."

Pete naturally did a double-take. I started to explain.

In school, I reminded him, we learn about that layer of atmosphere in the sky starting between 25 and 50 miles and going on up as high as 400—the ionosphere. The layer between 50 and 80 miles they call the E layer. In this layer the air molecules are more thinly scattered than at low levels, yet not as sparse as higher up. They are spaced just close enough to become heavily ionized by ultraviolet and cosmic-ray bombardment, yet not close enough to collide with each other and lose their ionization.

When waves from TV stations hit the ionosphere, especially the E layer, they are bent.

Pete had an I'm-way-ahead-of-you glint. "You mean they're bent like a spoon looks when you stick it in a glass of water?"

"Something like that."

"Okay, so they're bent," Pete went on. "But they pass right through this layer, don't they?"

I shot Pete my best I've-got-you-now look. "Most of the time they do. But suppose the E layer was very heavily ionized and the TV waves hit it at a very flat angle. What would happen?"

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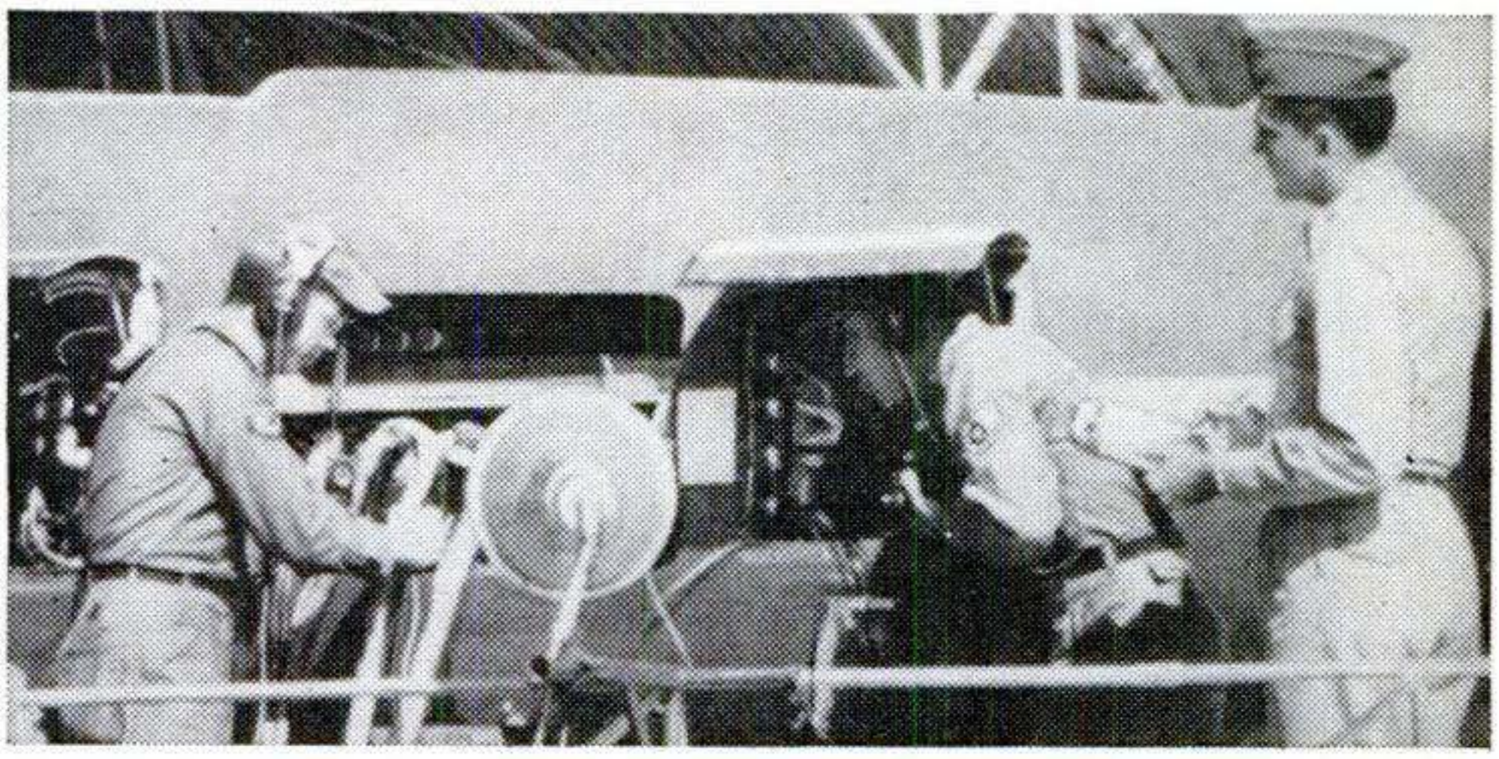

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Pete's eyes brightened. "They might bounce back to earth, like when you skip a stone off the surface of water."

"Right," I said. "Only a few waves bounce back, but when atmospheric conditions are just right that's all you need. In this case, there's another Channel 3 transmitting a picture of roller skaters about 400 miles away and it's pushing our Channel 3 off the air. This is called sporadic E skip."

"Gee," said Pete, "I had it figured all the time."

The phone started ringing. "Sure," I smiled, "and now that you're an expert on sporadic E skip, you can explain it to all our customers as they call in while I get on home for supper."

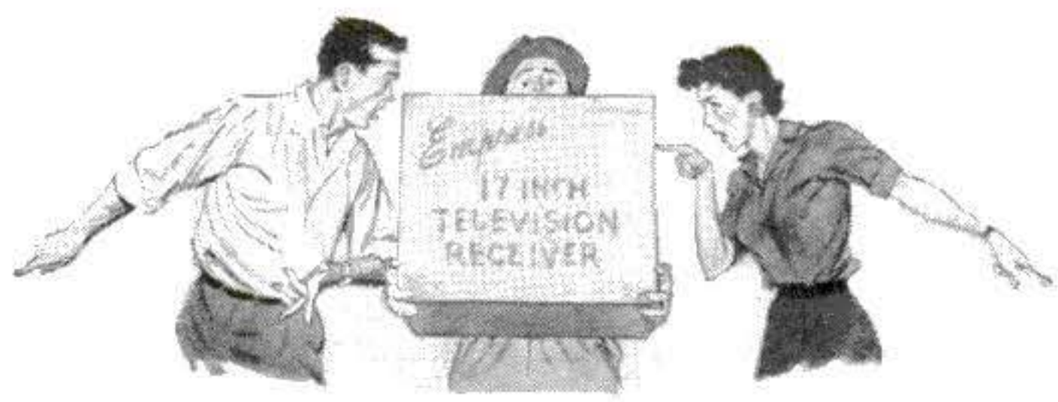
The Phantom That Sold a Set

THE pert young housewife said, "Don't bring it in here!"

Her husky husband said, "Don't listen to her; put it on that table."

I was delivering a 17″ portable TV for a department store. It seems that the wife, with her eye on the budget, didn't like the idea of the three-year financing, even for an anniversary present and even after the salesman had pointed out that it cost them only 13 cents a day.

Since the husband was bigger, I was admitted and hooked up the TV. The



picture came on beautifully—that is, on every channel except Channel 3.

On this channel a black jagged bar about a half-inch wide ripped horizontally through the picture with an accompanying buzz in the sound. Since I had checked the portable before delivery I was pretty sure it was that old phantom—TV interference.

The wife saw the picture and yelped, "It doesn't work. Take it out!"

The husband said firmly, "Give him a chance, dear, it just needs some adjusting." He gave me a pleading look.

I checked each appliance for interference. No soap. I started knocking on the neighbors' doors and tested their appliances. Still no luck. I eliminated the light switches one by one.

Then I noticed an attic stairway and went up and opened the door. A forgotten light bulb flickered in exact time with the TV's buzz. I knew what was wrong.

As in many old attics, the bulb was an ancient carbon-filament type with no frosting on the glass. The carbon filament had cracked but not opened up. Sparks were flying across the cracks. All this electrical action caused the filaments to resonate, and guess what frequency they resonate around—Channel 3.

I put in a new bulb, and the jagged bar and buzzing sound disappeared.

But can you beat it? The wife was actually unhappy that I had found the trouble. Then a thought struck me. I figured out what that bulb cost each day it was burning. It turned out to be 13 cents a day—exactly what the new set would cost. The wife was so pleased about saving the money the bulb would have burned that she relented. The set stayed. I didn't tell her, of course, that just as I had removed the bulb, it had given its last gasp anyway.

The Credit Risk

IN ORDER for a TV repairman to stay on the black side of the ledger, he has to size up customers in case they want credit. Little clues in their homes, such as shabby furniture, are sometimes a tipoff to a bad risk.

One new customer admitted me with a gruff "Look at that picture" before I had barely stepped through the door. The reception, I had to agree, was not good.

In some places, if you're located midway between two big cities, as we are, it is possible to get every channel from 2 through 13. This fellow was getting all of them—but with one complaint. Channels 4 and 11 had a heavy herringbone pattern on top of the picture. As I was examining each channel, the phone rang. I got the first indication of the man's credit status as he said into the telephone, "Not a chance! Possession is nine-tenths of the law," and hung up.

I went on working. All channels were coming in strong enough to show. But

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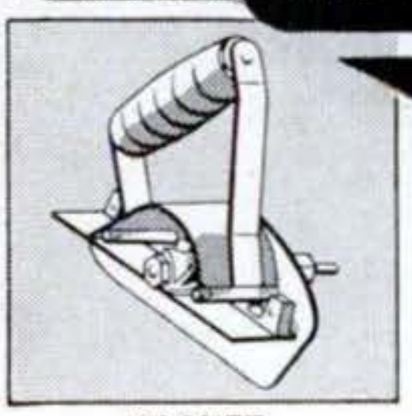
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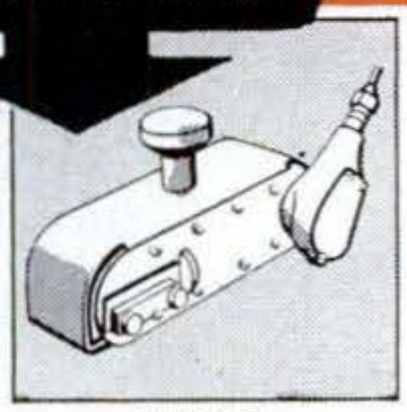
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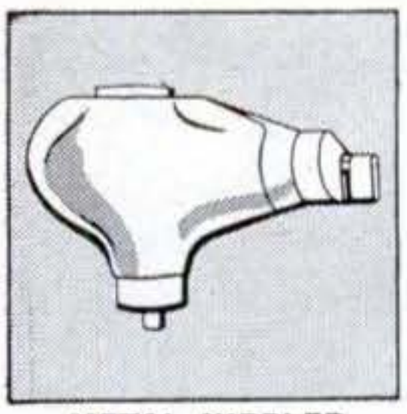
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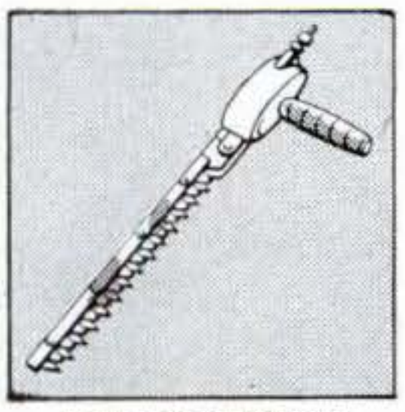
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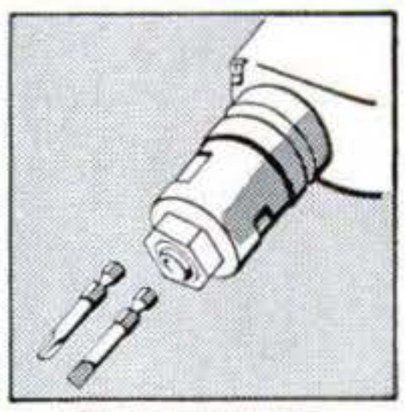
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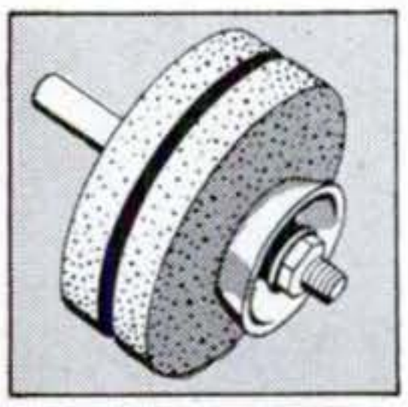
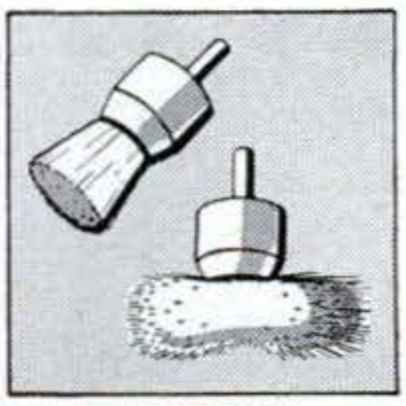
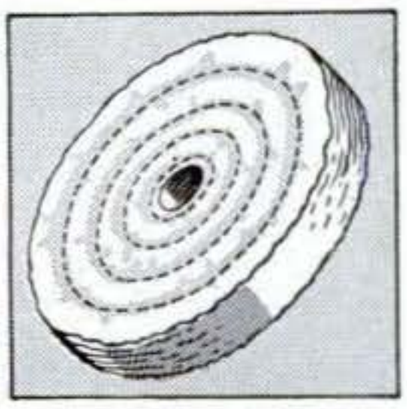
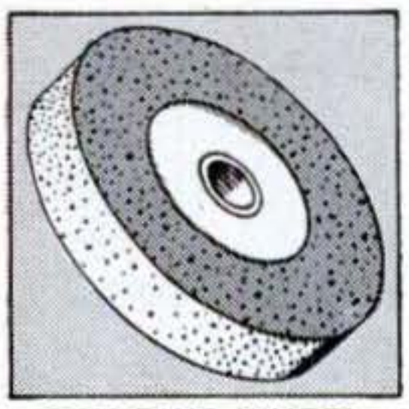
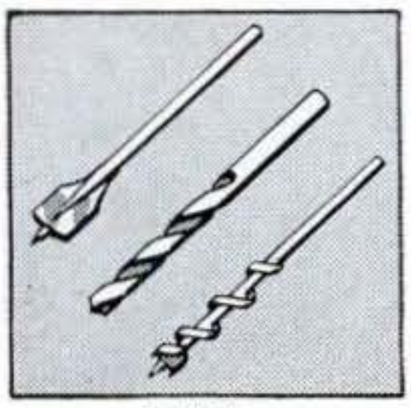

KNIFE SHARPENER


WIRE BRUSH


RAG BUFF WHEEL


GRINDING WHEEL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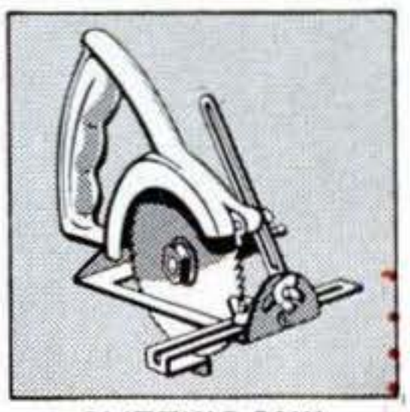
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Channels 4 and 11 were being interfered with by 3 and 10. The audio signal on 3 arrives on the carrier frequency of 65.76 megacycles. The picture signal of 4 arrives on a carrier of 67.25 megacycles. The sound for 3 and the picture for 4 are thus only 1.5 megacycles apart, while the sound and picture on 4 are 4.5 megacycles apart.

The TV set was not able to tune close enough to keep the sound of 3 from appearing in the picture of 4 as a herringbone overlay. The same thing was happening with Channels 11 and 10.

My unsmiling customer asked what I could do. "This is called adjacent-channel interference," I told him. "I can install traps that will nullify whichever frequencies you tune them to. Then you can cancel out Channel 3 while 4 is on, 10 while 11 is on, and so forth."

He said, "Install them."

I gingerly explained that he needed two traps, one for Channels 2 to 6 and one for 7 to 13, and that they were $20 apiece.

He growled, "Well, install them, boy, install them."

I did, and they turned the trick beautifully. But as I began writing the bill, I noticed a stack of other bills on a table, marked "for collection." There was also a letter from a sheriff. I handed him my bill and braced myself for a con pitch. Instead he handed me two twenties, then an extra one, and said gruffly, "Buy yourself a cigar."

Bewildered, I started to walk out. What was all the bad-pay evidence about? He called to me as I climbed into my truck.

"Incidentally, buddy, if anybody ever tries to push you around, let me know. I'm the new marshal."

Double People—Double Trouble

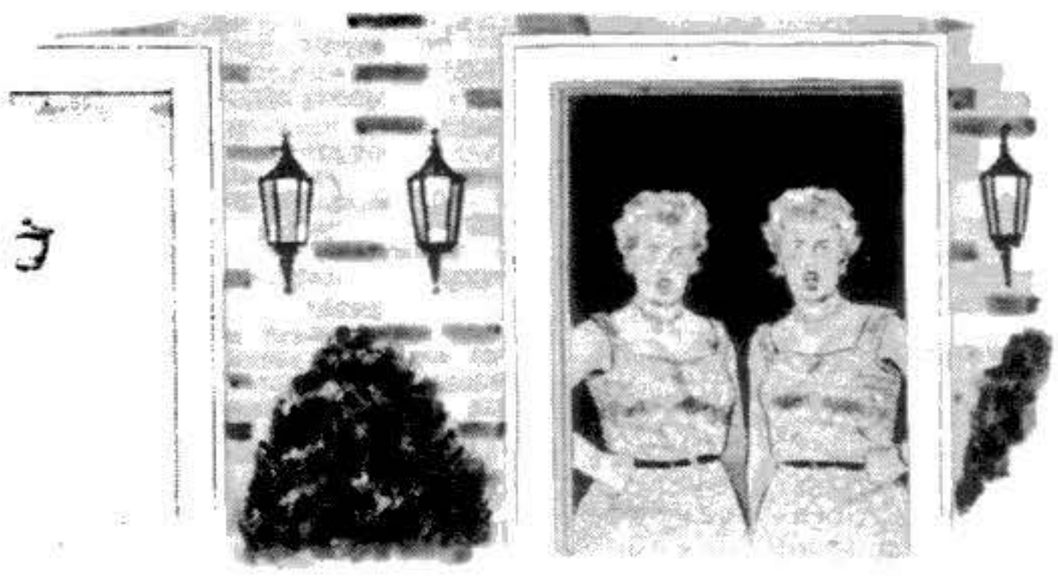
I received a call from a block of semi-detached twin homes. When I knocked on the door, two identical, well-fed women appeared. They shot a blast of fast-spoken words at me. They lived side by side, and they both had the same TV trouble. Intermittently, Channel 6 would be blanked out.

"There's a ham radio operator down the street," they told me. "It's his fault."

The two husbands had been in one house watching the fights, and the twins had gone into the other home to see a love story. When they turned on the set, Channel 6 disappeared. The twins quickly commandeered the other set, but that Channel 6 was also knocked out. They called the ham and, sure enough, he had been broadcasting.

I turned one TV set to 6. Then I turned the other set to 3. Channel 6 washed out. I knew what had happened.

In every TV set there is a circuit called the local oscillator. It maintains its running frequency about 20 mega-



cycles higher than the channel the set is tuned for. In some sets, a little of this oscillator energy sometimes leaks and radiates out the antenna.

The twin living rooms were back to back and the TV sets were only inches apart. When one of the sets was tuned to Channel 3, its local oscillator ran 20 megacycles higher, which is Channel 6's frequency, and this blanked out Channel 6 on the other set.

Moving the sets to different walls quickly cured the trouble. But the end of the story didn't come until later. I got a call from the radio ham who had also been blamed for other interference in the neighborhood. That is, he had been blamed until the twins heard about it. They went from door to door and quickly quelled all complaints. END

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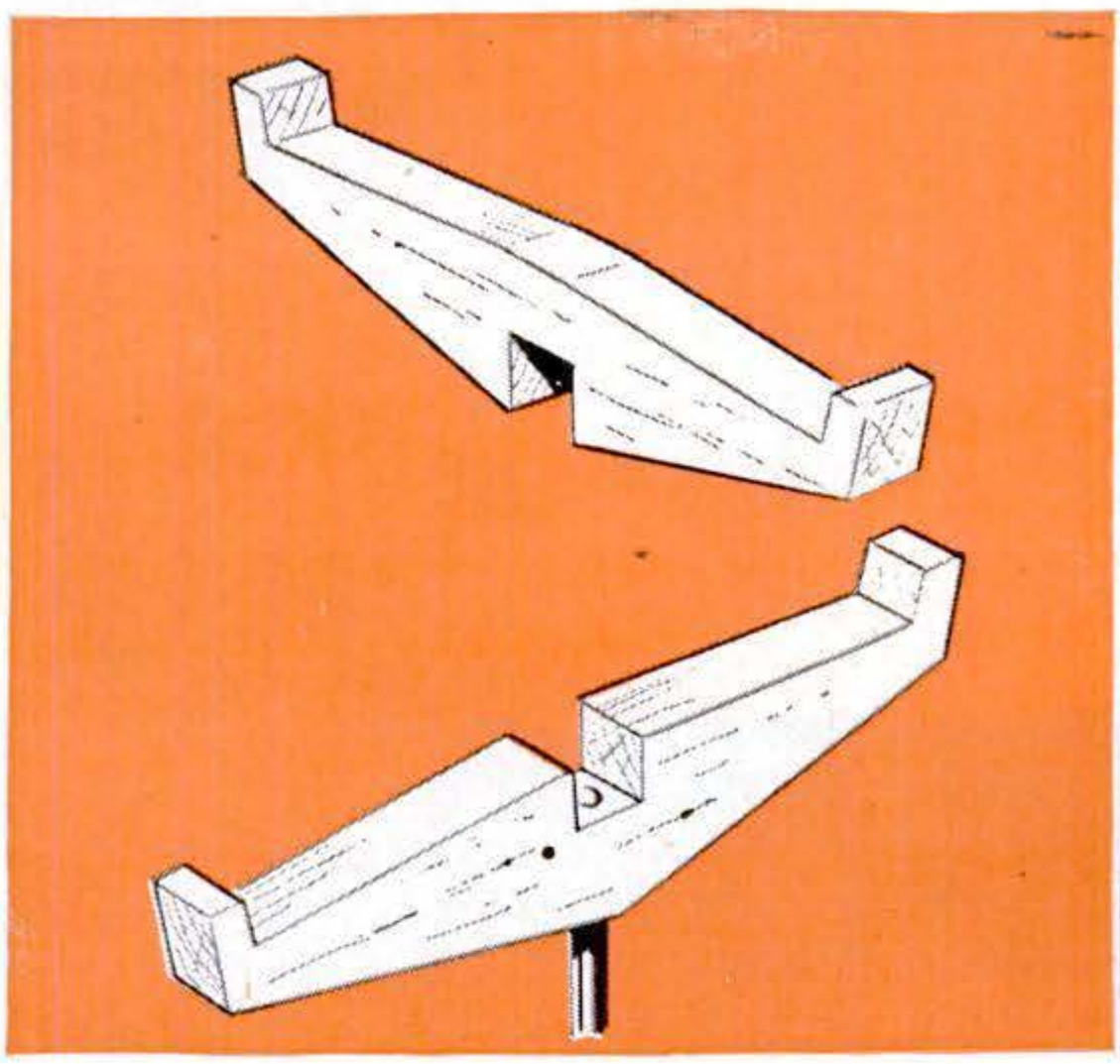
Short Cuts and Tips

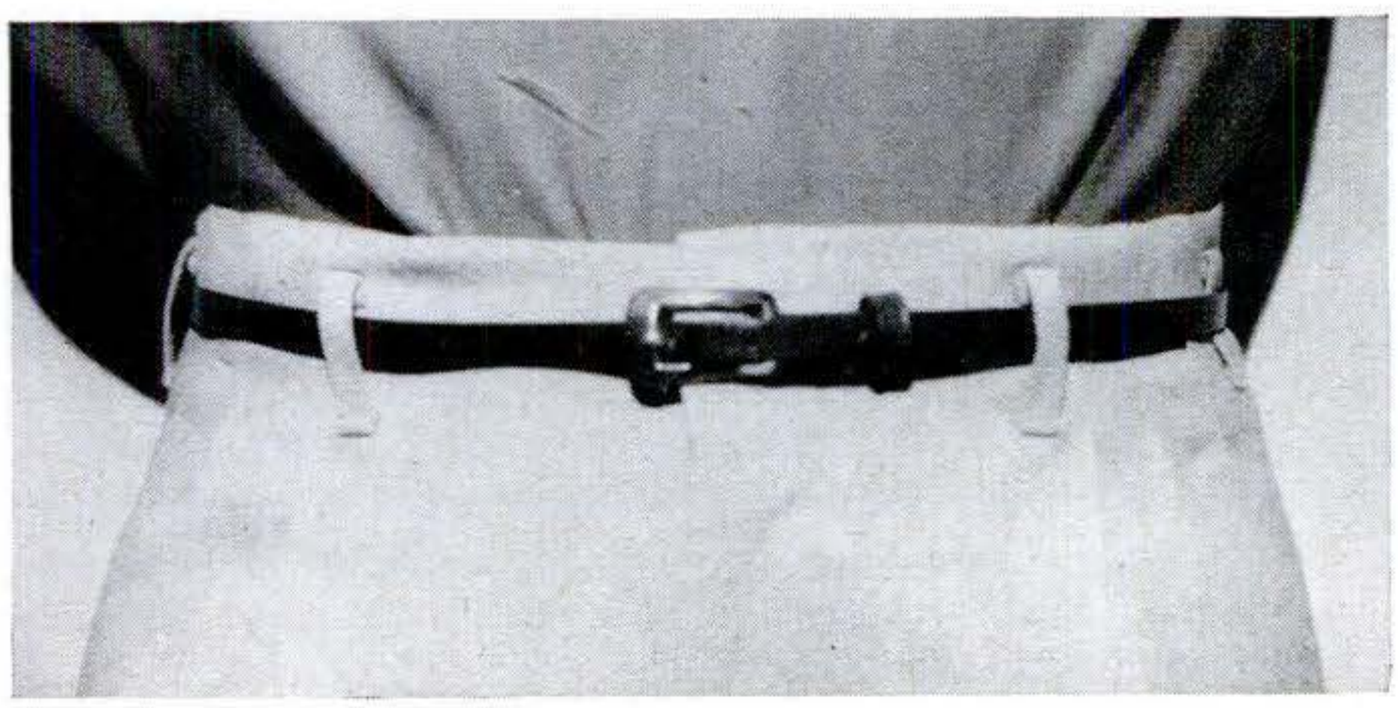
FROM PS READERS

Big Saucer Makes Bird Bath

BIRDS that stay the winter will flock to a birdbath because they can't depend on puddles, wading pools and summer showers for water. A giant flowerpot saucer makes a good one. Rest it on crossed pieces of wood, shaped on a bandsaw or jigsaw. You can buy a 16″ saucer at a nursery (mine cost $1.75). If it is unglazed, seal the upper surface with varnish.—*R. H. Copperud, Stockton, Calif.*



Plastic Belt Made from Twin-Lead Keeps His Trousers Up



WHEN my leather belt wore out, I salvaged the buckle and the rivets and re-used them on a length of TV aerial twin-lead. The plastic is durable and resists scuffing, and my new belt has the conservative appearance of the plastic ones that cost more than a dollar in the stores.—*J. A. Stockton, Pittsburgh, Pa.*

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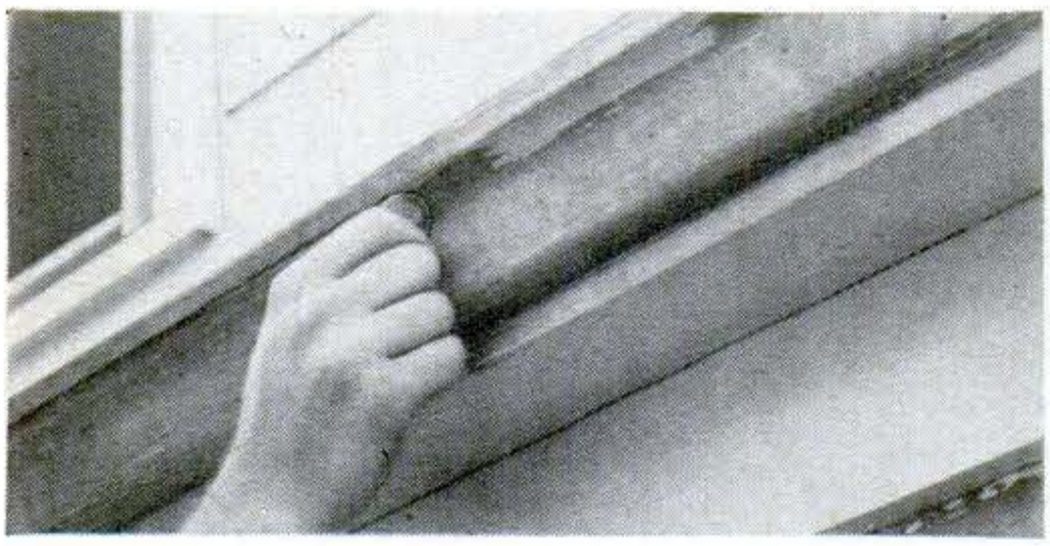
Short Cuts and Tips

Old Tires Start Brush Fires Fast

WHEN we moved into our new house, we had dead trees, brush and weeds to dispose of. I built piles of debris, each on top of one or two worn-out tires stuffed with newspaper, and set a match to them.

My gas station was glad to get rid of the tires and I found them a sure-fire way to burn anything—even wet or green trash—with minimum smoldering. —*F. B. McCue, Tarentum, Pa.*



Coin Makes a Curved Scraper

SCRAPING off paint that is peeling from gutters can be a real headache, especially when you reach the curved sections. Where there are concave surfaces, try using a large coin or a heavy metal washer as a scraper. The disk fits the curve and a few scrapes get down to bare metal.

Cement Serves as Mask

EVER try rubber cement for masking small surfaces? Brush it on and you can spray or brush paint right over it. I used it to protect chrome strips on my car. When the new paint job was dry, I rubbed off the cement and any paint on it rolled off, too.—*H. Y. Moon, Orient, N.Y.*

NEXT MONTH: **Math Short Cuts for the Home Owner**

WHETHER you're a whiz or a washout at mathematics, you'll find something of value in next month's bonus booklet, "Math Short Cuts for the Home Owner."

It's packed with tricks of a dozen trades for measuring, estimating and computing—the easy, time-saving way. Some of the tricks are so simple you'll be surprised you never thought of them yourself. But you *could* forget them again. So be sure to save the booklet. It's No. 6 in the Popular Science Reference Library. Watch for it—in the December issue.

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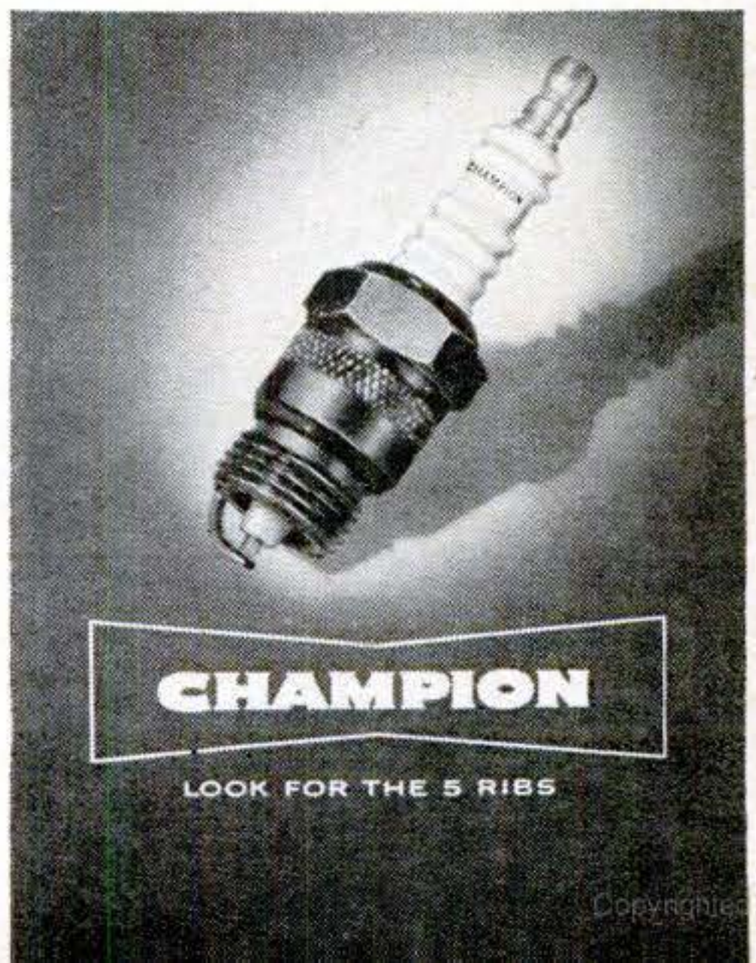

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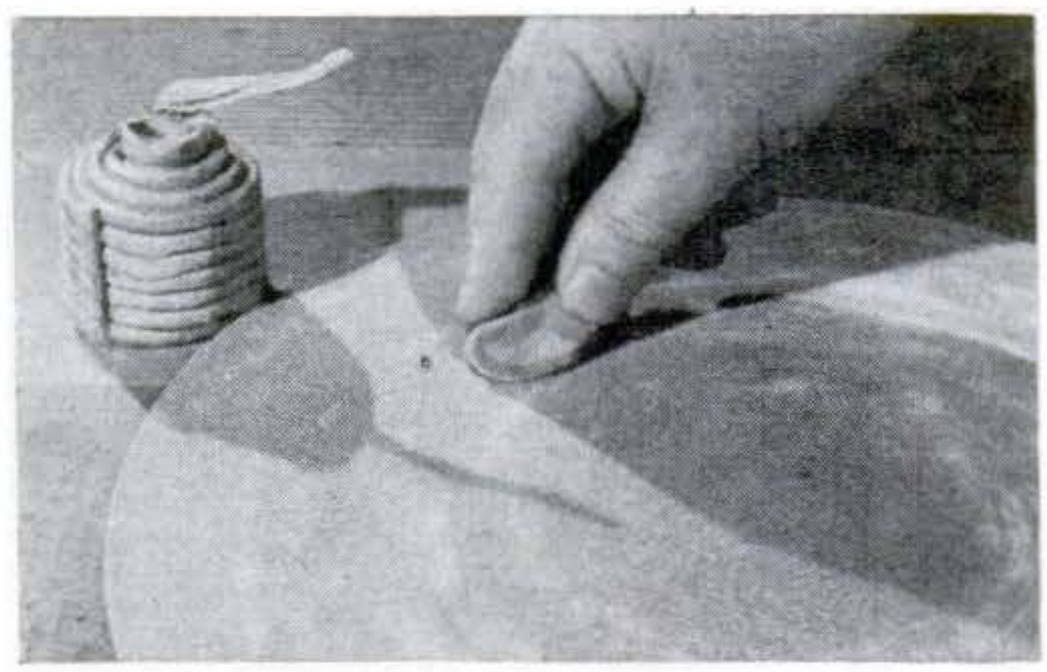
Short Cuts and Tips

Paper Insulation Helps Warm You

AN OLD hobo trick will keep you warm on hunting trips if the temperature drops unexpectedly. Fold several thicknesses of newspaper to reach from armpits to hips and slip it under your jacket. It will seal in body heat and act as a windproof insulation. Keep newspapers in the car trunk on overnight trips, too—handy to slip between too-thin blankets.—*M. O'Higgins, Arlington, Va.*

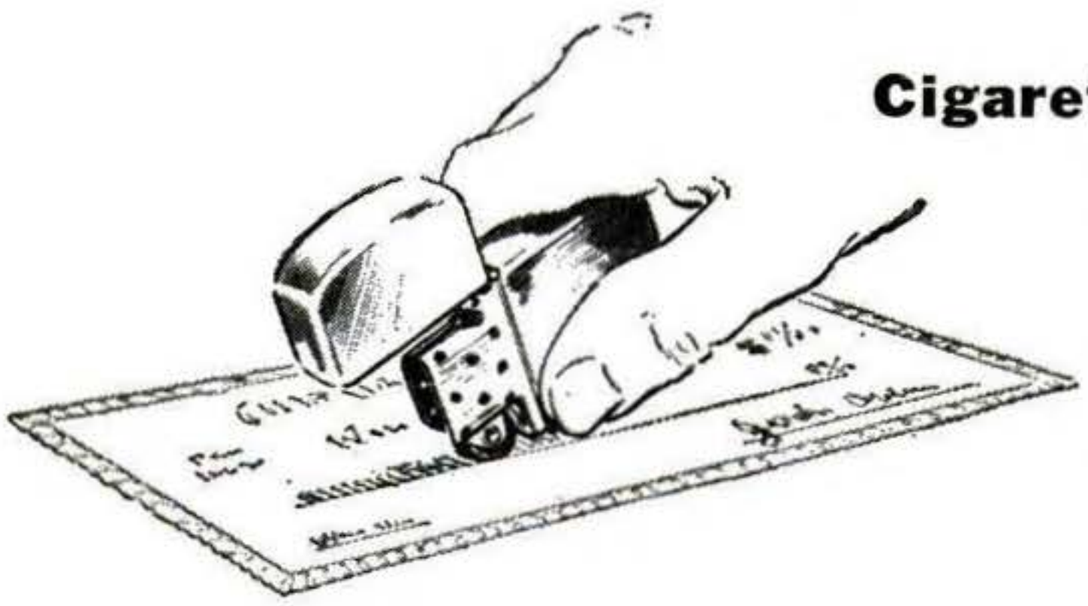
Paint Can Totes Brush Keeper

STRAP a tobacco tin to the paint can with a rubber band and you have a place to park the brush when it is not in use. Keep the tin filled bristle-high with paint-thinner. If it should leak at the bottom seam, flow thin glue around the bottom and allow it to dry before pouring in the thinner.—*Murray Kent, Detroit, Mich.*



Putty Cleans Sandpaper

IF YOU'RE down to your last sandpaper disk and it clogs up before the job is done, reach for a lump of weatherstrip putty. Press it over the disk, folding it frequently to present a fresh surface. The tacky putty reaches between the abrasive grains and cleans them out better than brushing.—*Ken Murray, Colon, Mich.*



Cigarette Lighter Protects Checks

CARRY a cigarette lighter with an exposed flint-sparking wheel? If you do, you are also carrying a ready-made guard for protecting your personal checks. Simply lay the checks on a flat surface and roll the wheel over the written amounts with just enough pressure to make perforations.—*John Comstock, Wellsboro, Pa.*

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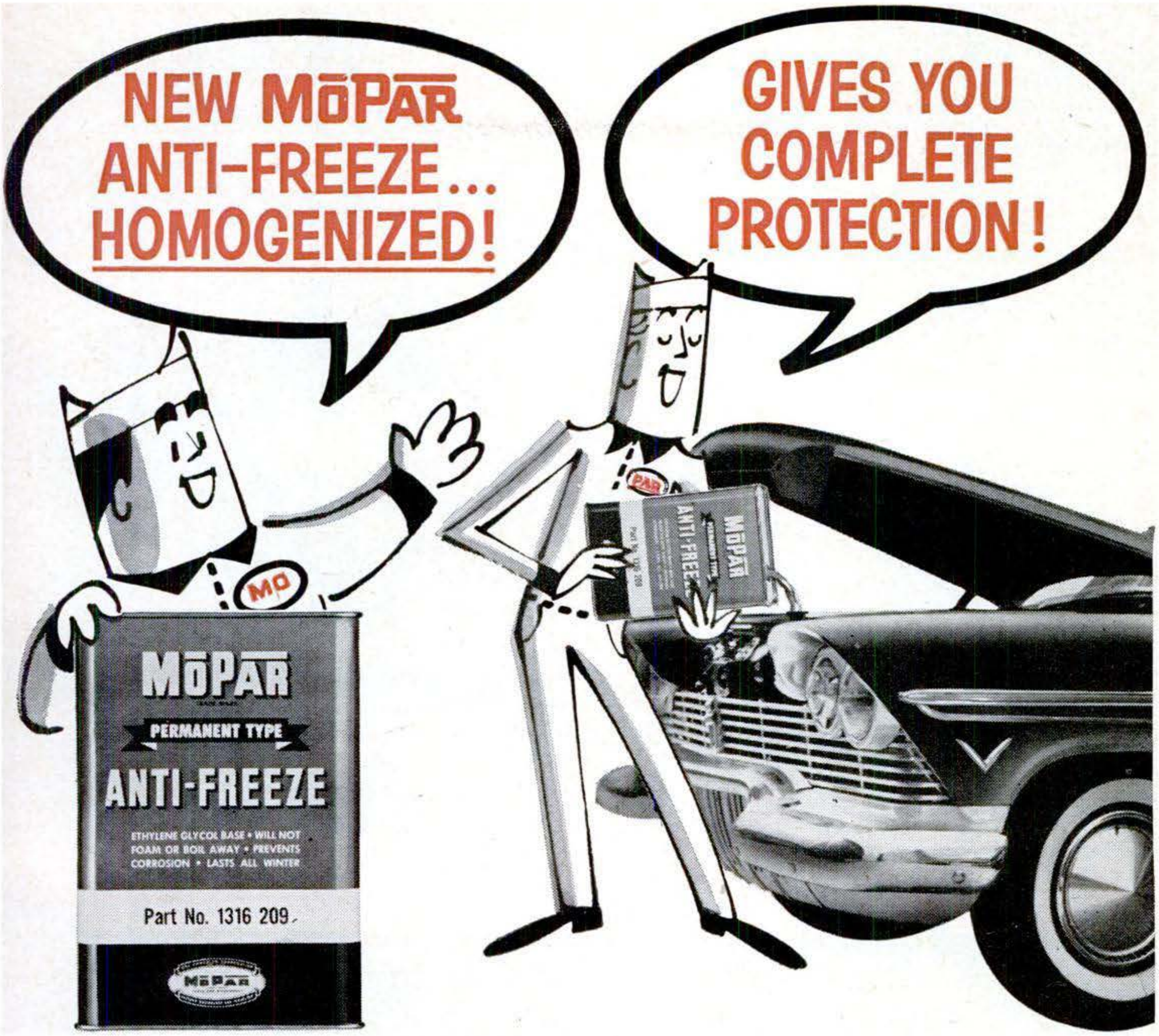

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DETROIT 31, MICHIGAN

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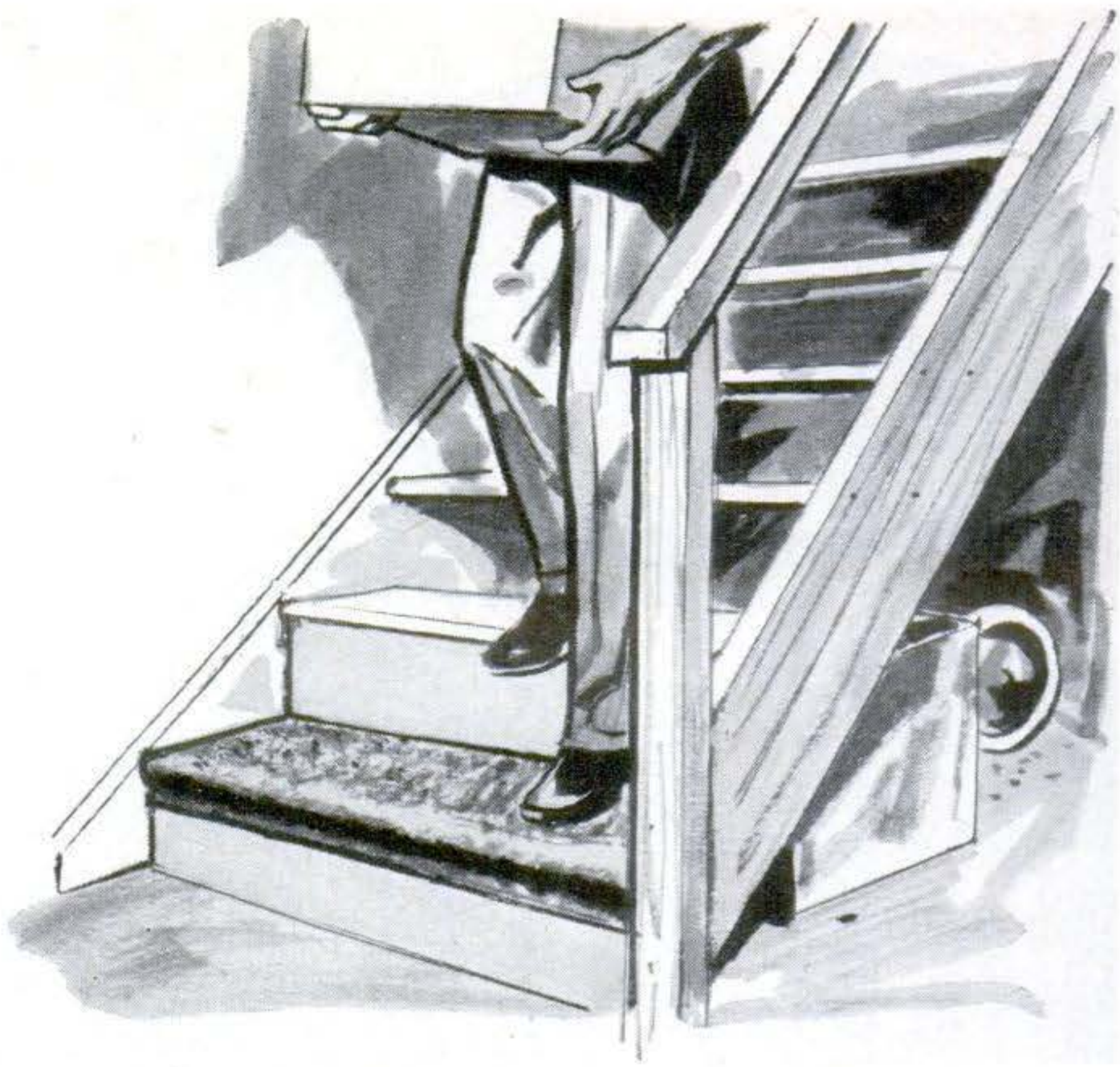
Short Cuts and Tips

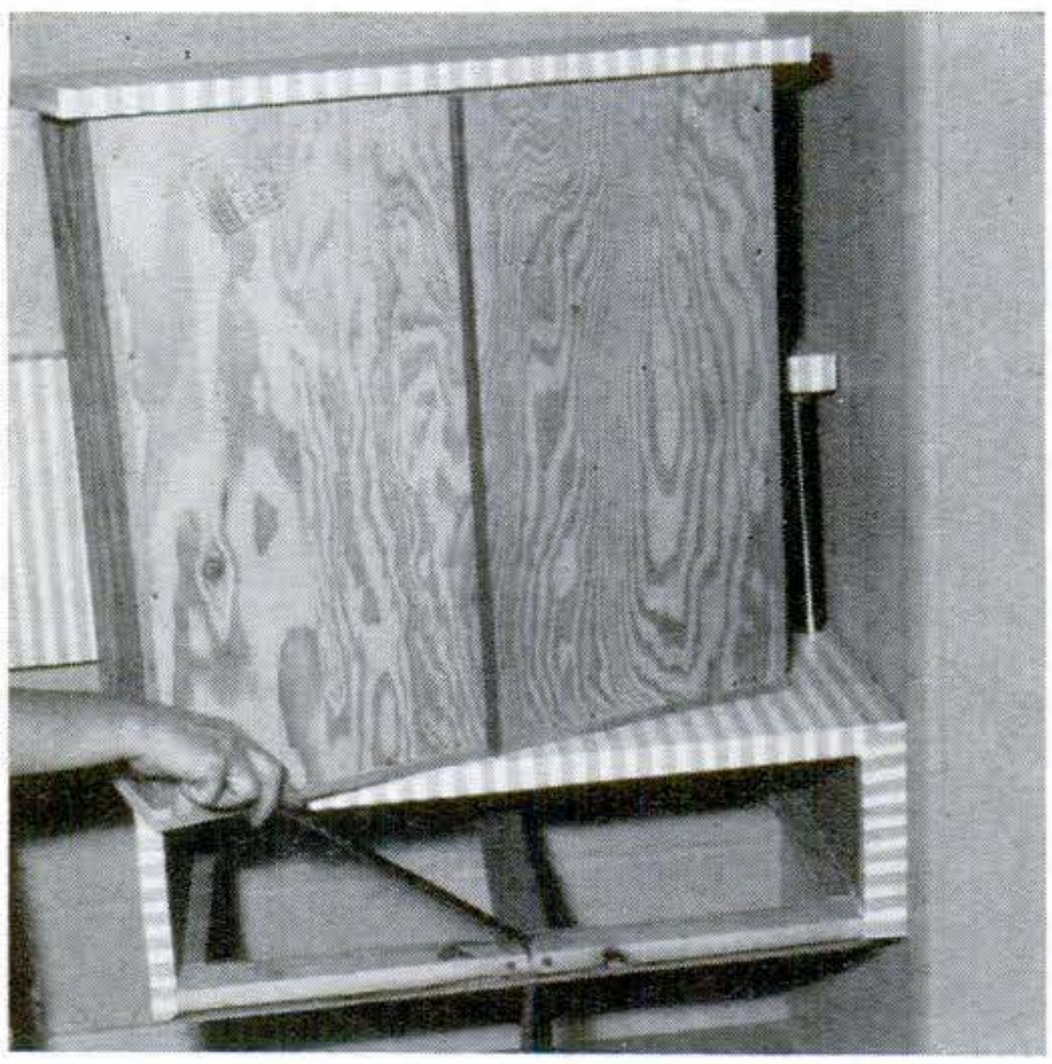
Underfoot Signal Makes Stairs Safer

CARRYING large objects down to the basement used to mean counting each step so that I'd know when I had reached the bottom. But I don't have this problem any longer since I tacked a piece of soft carpet to the bottom tread. Now I can tell by feel and for sure when I hit the last step.—*J. A. Conrad, Erie, Pa.*



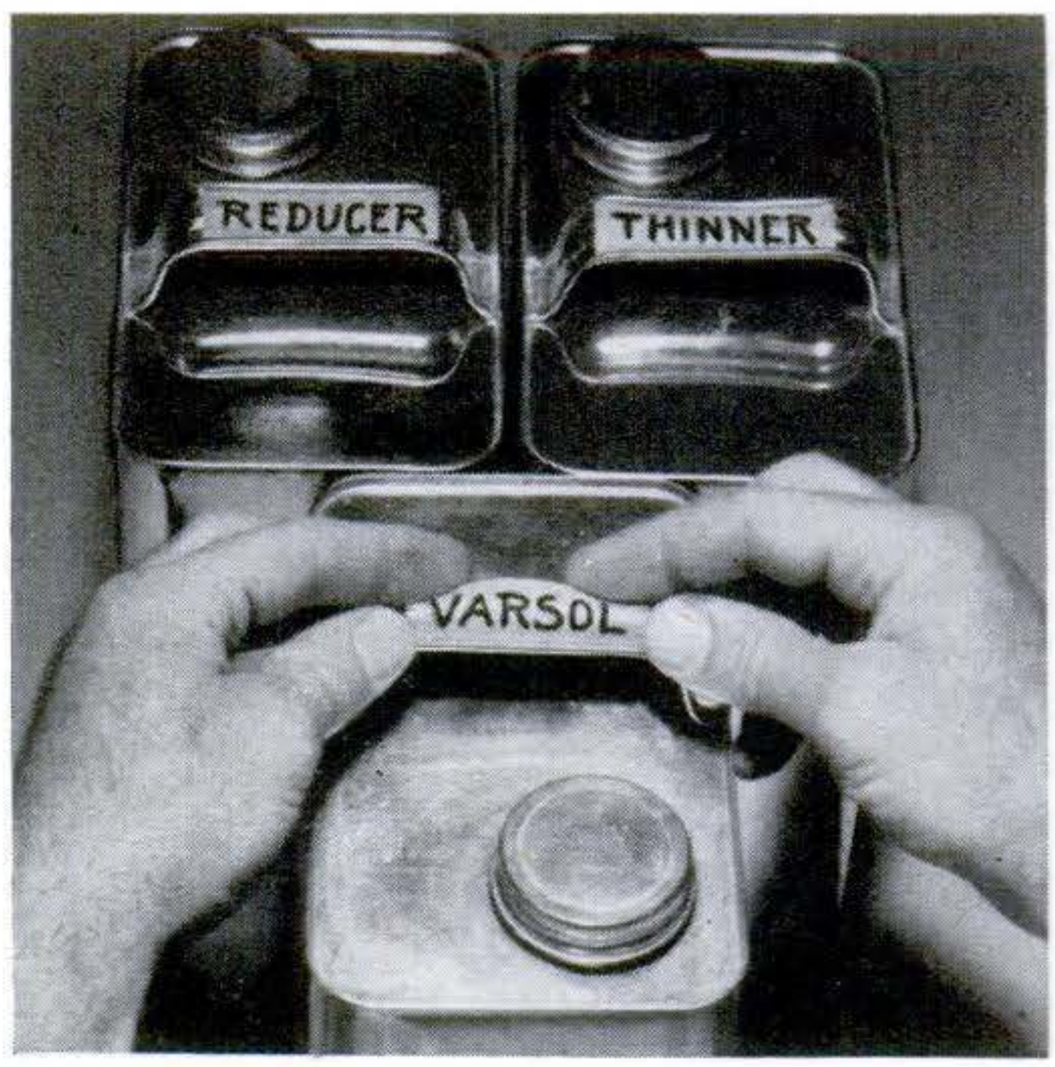
▶▶▶After burning my wrist on the hot muffler while making adjustments on my gasoline-powered mower, I added a guard. I spiraled heavy wire around the muffler and fastened it to the neck for support. There is enough space between muffler and wire to block most of the heat conduction.—*John A. Compton, Johnstown, Pa.*

▶▶▶Those spring-grip clothespins fitted with hooks for hanging them over a towel bar or a shower-curtain rod are just as handy in the shop for hanging stocks of sandpaper. Mark each pin with the grade of paper it holds and hook them over a wire clothes hanger near the workbench. —*E. B. Lillie, St. Petersburg, Fla.*



Drawer Rides Door Track

THE T track designed for use with sliding doors makes an excellent guide for cabinet drawers. The track is fastened to the bottom of the drawer and slides in a groove in a center rail below it.—*W. G. Waggoner, Sacramento, Calif.*



Sandpaper Labels Gallon Cans

YOU can make non-slip labels for the handles of gallon cans from fine sandpaper. Cut a strip just wide enough to fit into the groove formed by the handle, arc it slightly and snap it in, abrasive side down.—*H. R. Colpe, Alexandria, Va.*

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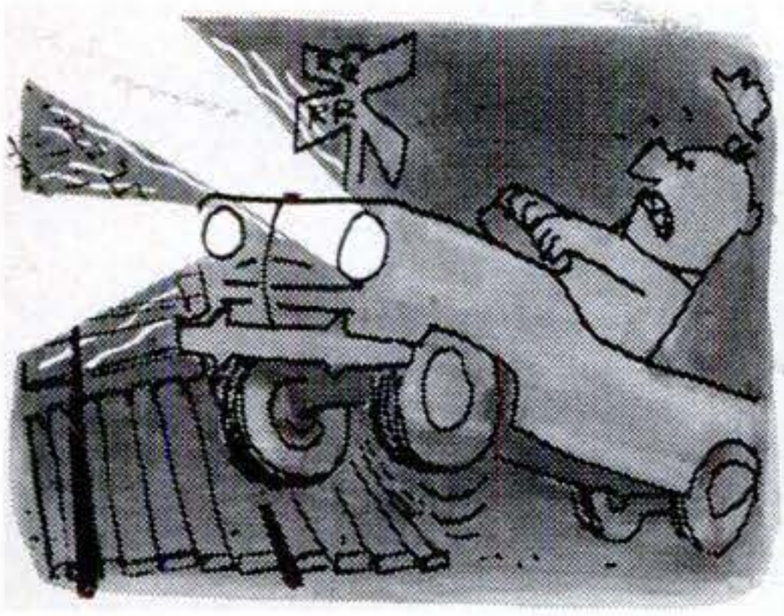
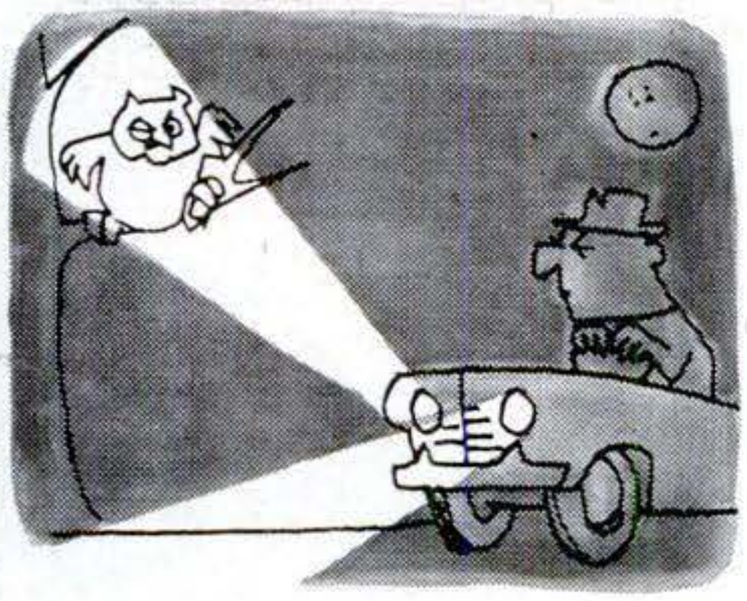
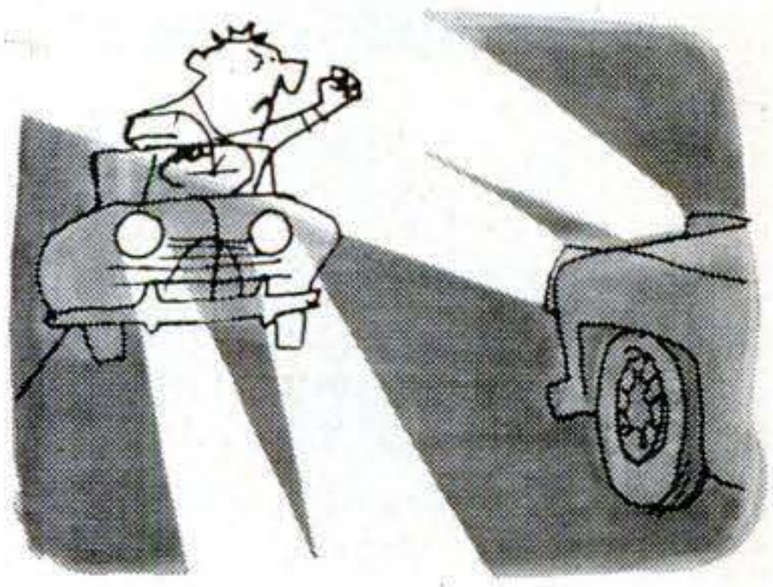
How to get more light on the road *from your present headlamps!*



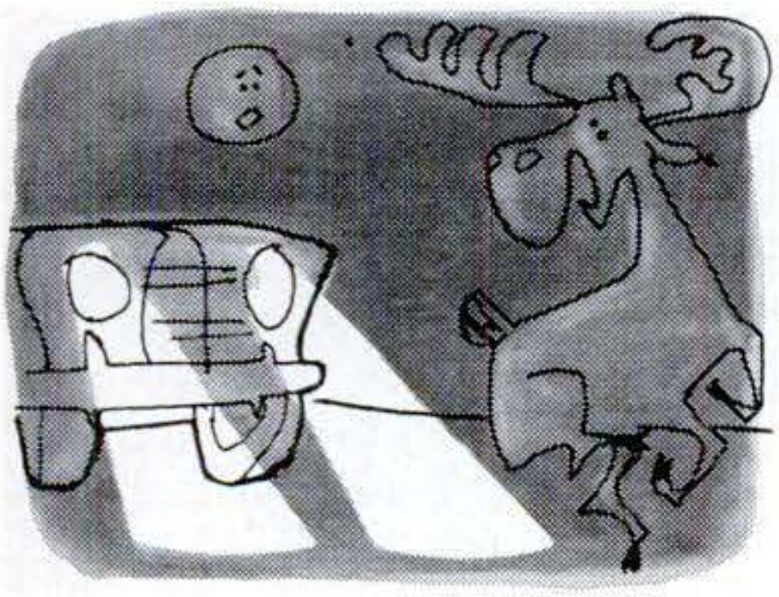
1. Since headlamps are detachable, they are subject to road shock and vibration which can jar them out of position and mis-direct their light.



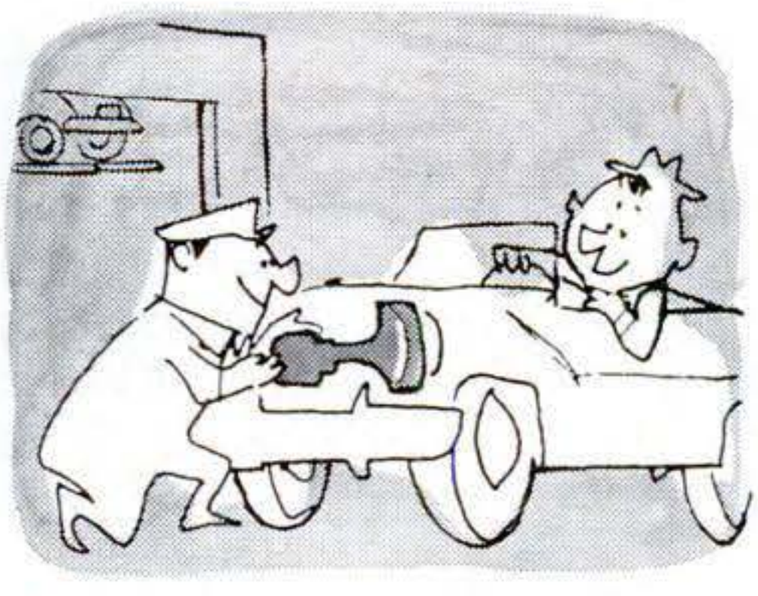
2. A very slight change in their position (so insignificant you can't even see the change) makes a big difference in the light you get down the road.



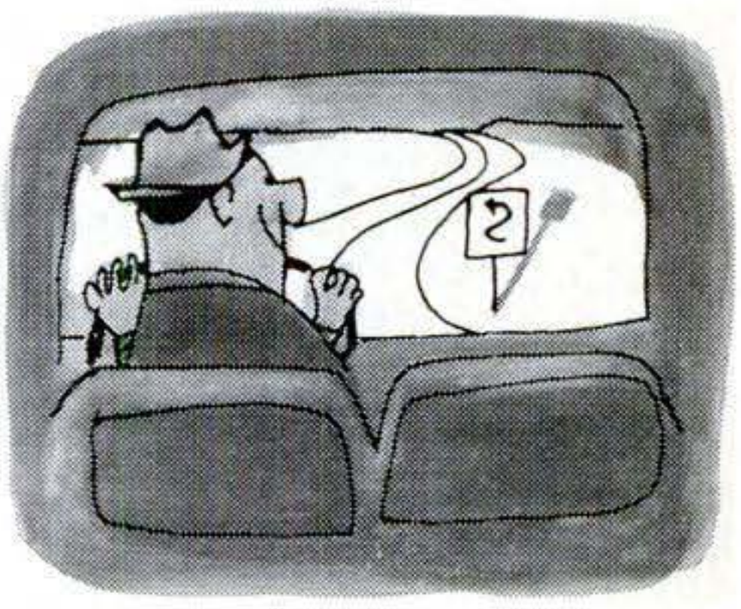
3. Ever have oncoming motorists "flash" their lights...believing you were driving with your "brights"?—when it was your *lower* beam . . . aimed high!



4. When headlamps are aimed low, the beam is too short . . . and you might not see in time to stop in time.



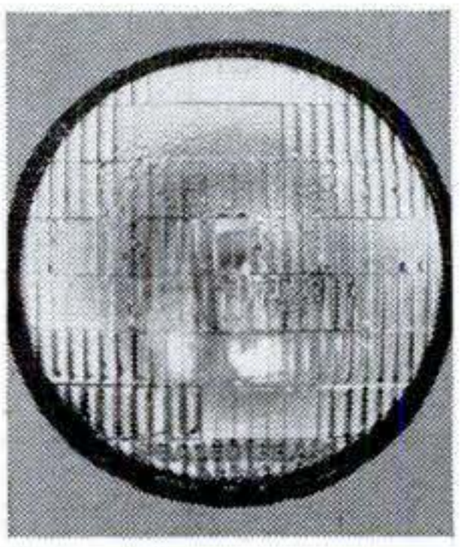
5. Your dealer can tell if headlamps are mis-aimed, and he can aim them accurately in minutes, even in daytime.



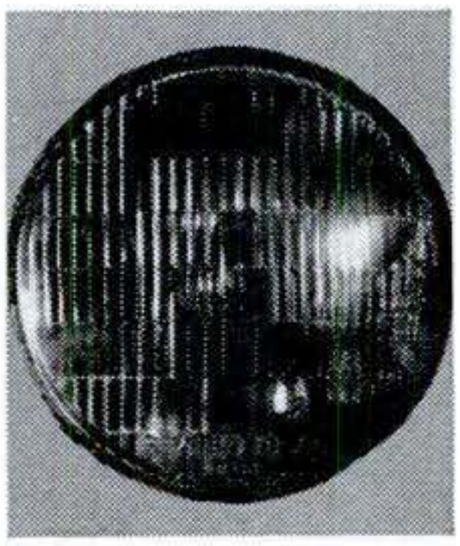
6. So, to get *more light* where it is needed . . . from your present headlamps . . . have them aimed *today!*

. . . and, if your headlamps are over 2 years old, here's how to get even more light!

Take a look at your *unlighted* headlamps. If they look like those at right, even re-aiming won't give you all the light you need. They should be replaced with new G-E *All-Weather* Headlamps that are all glass . . . their reflectors always stay shiny. When driving on the *lower* beam, G-E *All-Weather* Headlamps let you see better in fog, rain or snow and against the glare of oncoming traffic. Their *upper* beam reaches far and wide for safer driving on the open road.



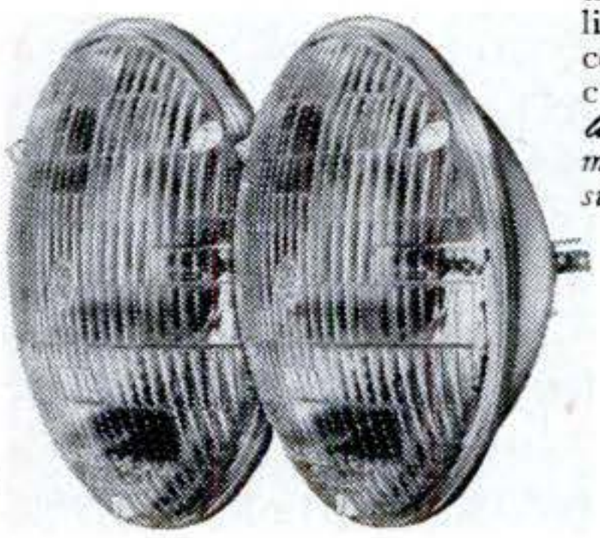
WATER DROPLETS inside the lens not only scatter the light, but they also help discolor metal reflectors. This can't happen with G-E *All-Weather* Headlamps—*moisture can't possibly get inside.*



DISCOLORED REFLECTORS absorb light rather than reflect it, causing a loss of up to 50% of the original light output. Dirt and moisture can never enter G-E *All-Weather* Headlamps so the *reflectors always stay shiny.*

BLACKENED BULBS in old-style headlamps block out the light from the filament and cause a dangerous drop in light output. This can't happen with G-E *All-Weather* Headlamps because *there are no inner bulbs!*

Get a pair of G-E *All-Weather* Headlamps today—and have your dealer aim them when he puts them in. You'll see the difference tonight. General Electric Co., Miniature Lamp Dept., Nela Park, Cleveland 12, Ohio.



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GENERAL ELECTRIC

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Short Cuts and Tips

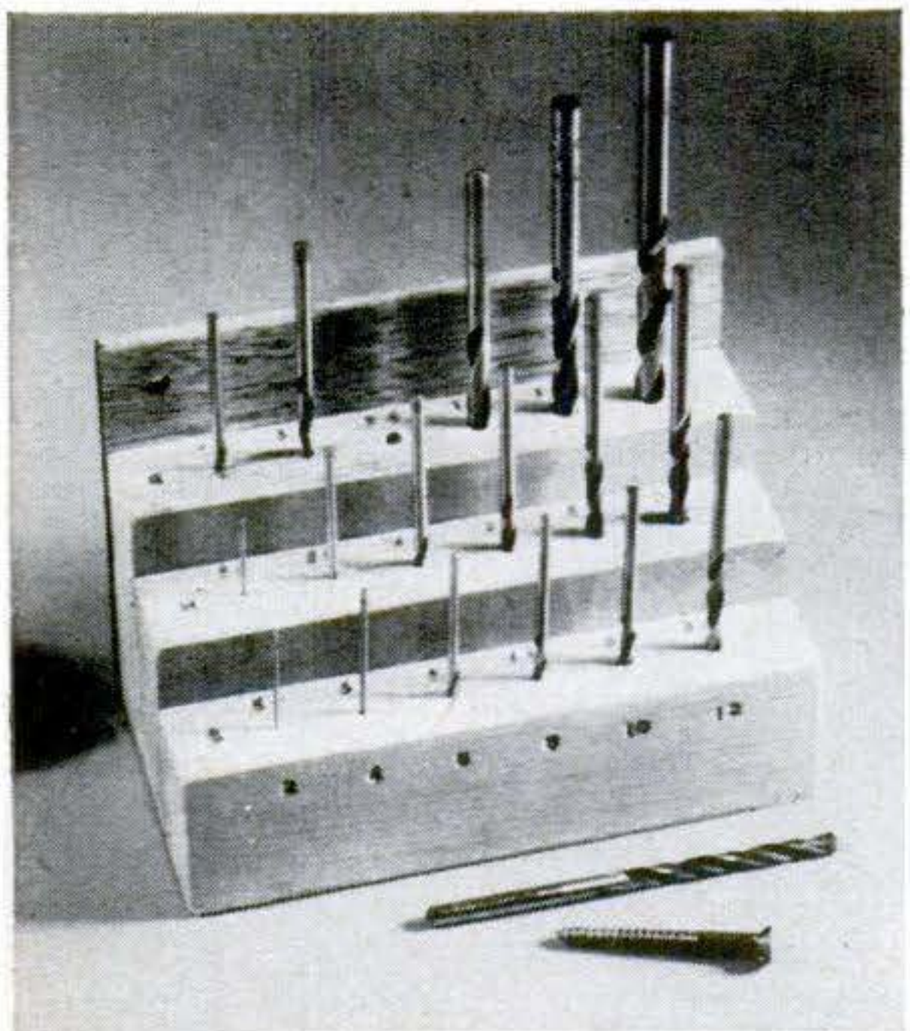
Hacksaw Blade Butters Tiles

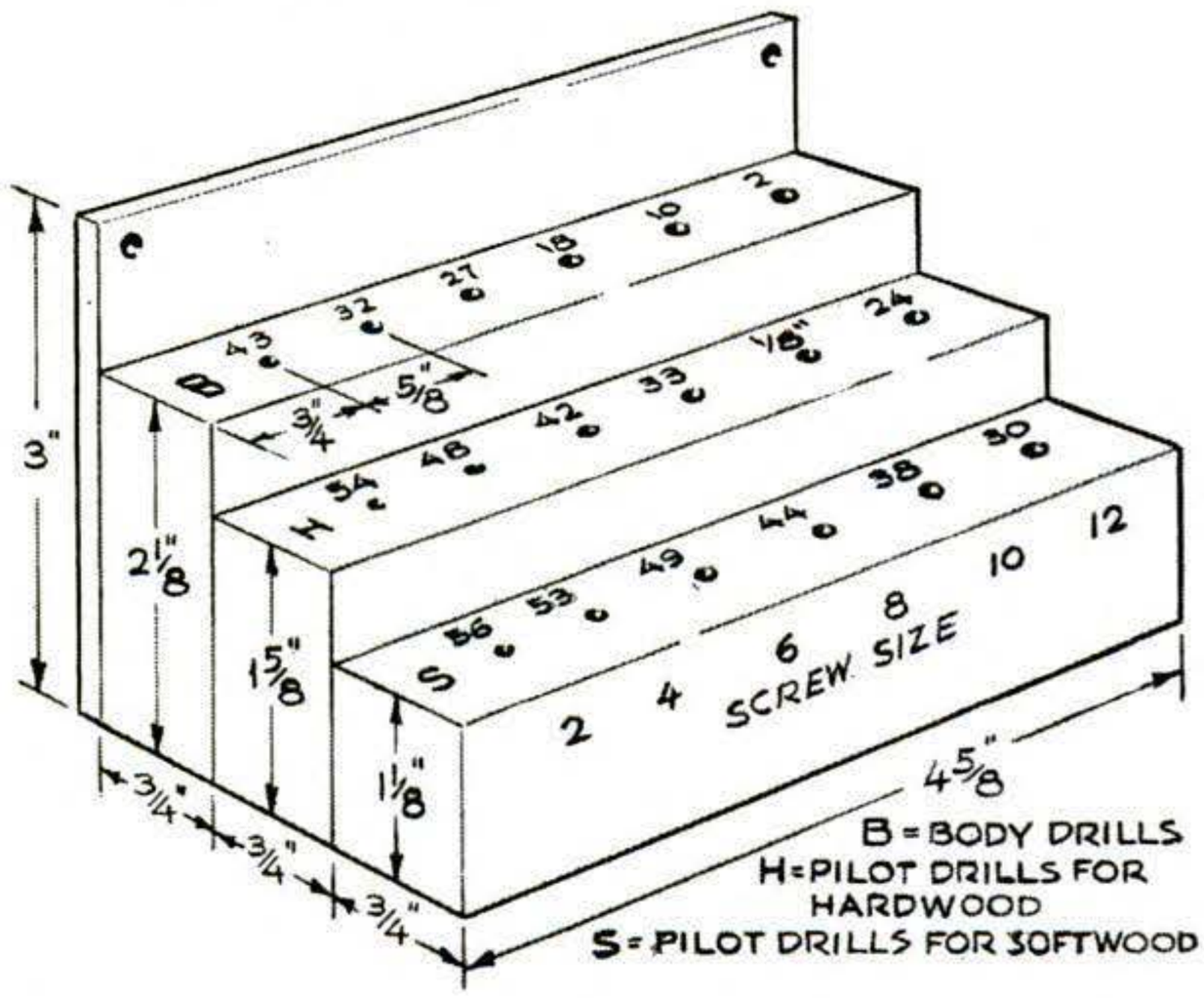
WHEN replacing a few tiles or doing other small surfacing jobs, you can improvise a tool for spreading the mastic or other adhesive. Just slip a hacksaw blade between the jaws of a spring-grip paper clip. Rubber tubing, split to take the blade, will tighten the jaws of the paper clip.—*C. H. Willey, Penacook, N. H.*

▶▶▶EVER try crude oil to cover scratches on mahogany furniture? I apply a thin coating and let it stand for a few days before wiping it off. When the wood is polished, the scratches have disappeared. —*Mickey DeCato, Paterson, N. J.*

▶▶▶WHEN removing fireplace ashes, it's a good idea to burn a wadded newspaper in one corner of the hearth. The rising hot air will draw the dust you stir up the chimney and keep it from blowing out into the room.—*R. Bauman, Somerset, Pa.*

Stepped Hardwood Rack Makes It Easy to Find Drill Bits





THE selection of a drill bit is a cinch since I made this stepped rack for my shop wall. It consists of three blocks of maple backed with hardboard.

Before assembling the blocks, I drilled 1"-deep pockets for the bits. The hole for each bit was made with a bit of the next larger size. Then I nailed the center block to the block in front, and the rear block to the center one. Pre-drilled holes made it easier to drive 1¼" nails into the hardwood without hitting the storage pockets. I used ⅝" box nails to fasten on the back panel.

Letters and numerals impressed on the rack with steel stamps, then inked in, indicate the sizes and types of drill bits stored.—*Walter E. Burton, Akron.*

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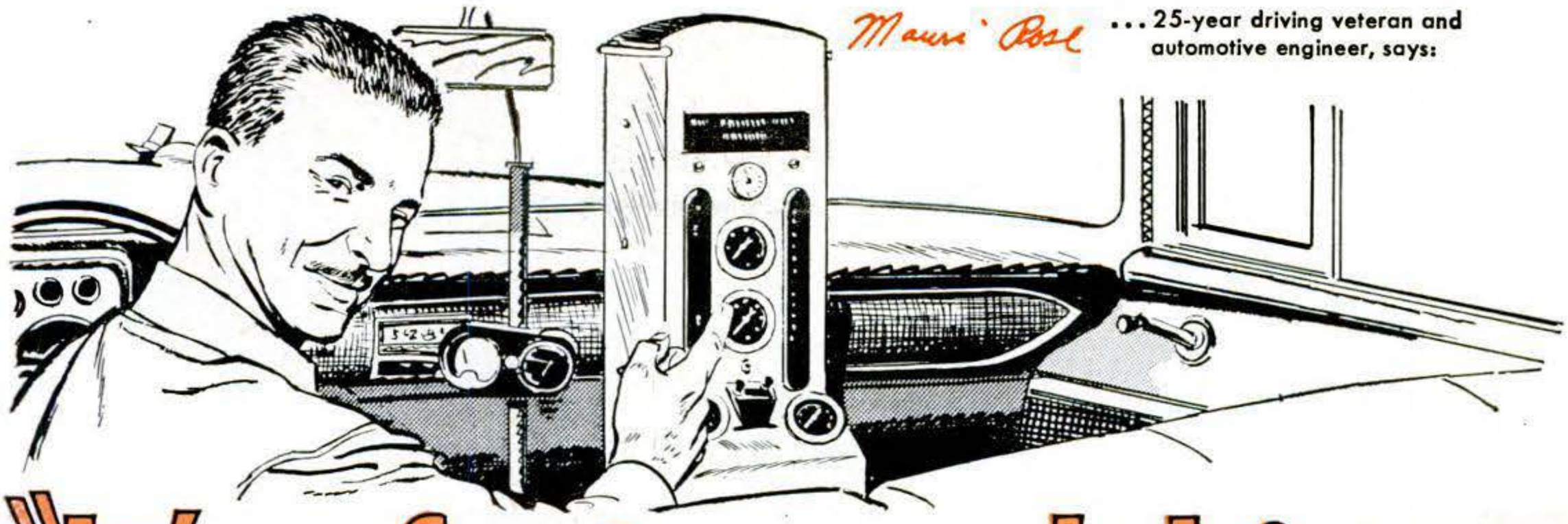

Maurice Rose ... 25-year driving veteran and automotive engineer, says:

"It's a fact...good drivers get good gas mileage"

"Here at the proving ground, we check fuel consumption right down to fractions of an ounce, under every kind of driving condition."

"We can actually measure the gas wasted by this kind of driving, with its unnecessary acceleration, needless stops and starts."

"Good driving—staying in lane, observing speed limits, and keeping alert at all times—can cut gas consumption by as much as 50%."

"Good drivers keep cars in good shape! Have your carburetor and other mechanical parts checked regularly by a trained specialist!"

Rochester carburetors are engineered to give you economical operation . . . quality-built to manufacture more miles from every gallon of gas!

Your Rochester Carburetor Specialist will help you enjoy top economy for the life of your car. See him regularly . . . he's a graduate of the finest service training available anywhere . . . he's worked with General Motors and United Motors Service experts . . . he's by far your best bet for low-cost, high-mileage maintenance!

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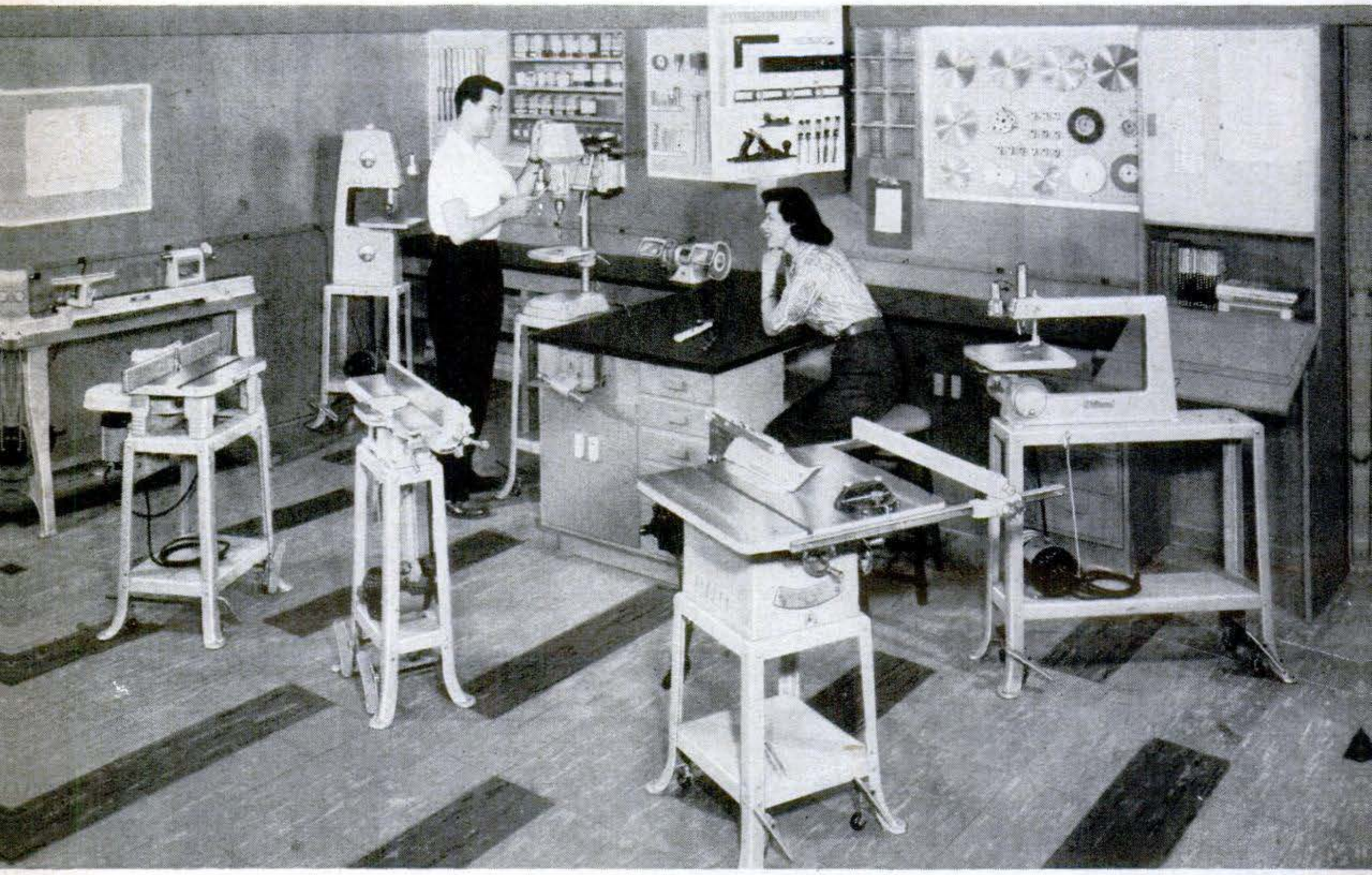
***NEW** convenience-designed workshops YOU can build!*



DELTA HOMECRAFT Power Tools are as accurate and easy to use as they are good looking. And in Delta's complete line of individual tools (most complete in the world) you'll find the tools that are exactly right for you—at terms exactly right for your budget. Above: "newest look in the world's finest power tools" shown in a Delta-designed "Dream Shop" that you can build in your home.

FREE WORKSHOP PLANS!

* Complete plans and step-by-step instructions for building the convenience-designed workshops shown above—plus complete bills of materials and a beautiful full color illustration of each shop to guide you in color selection.
* New Delta Workshop Reference Manual including complete details on New Advanced Design Delta Homecraft Power Tools.
* Catalog of famous Deltacraft workshop books.

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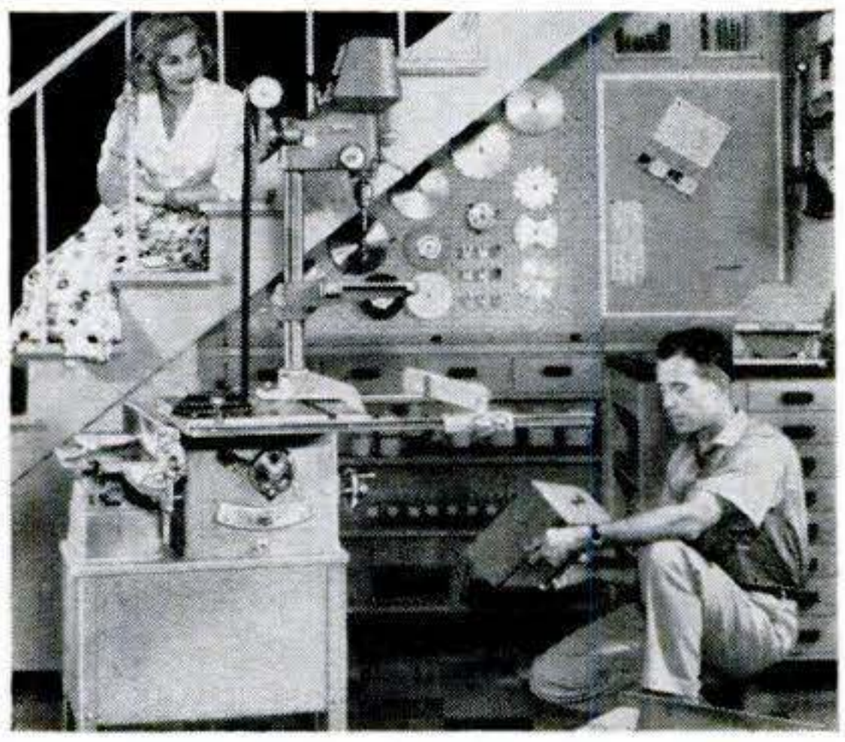
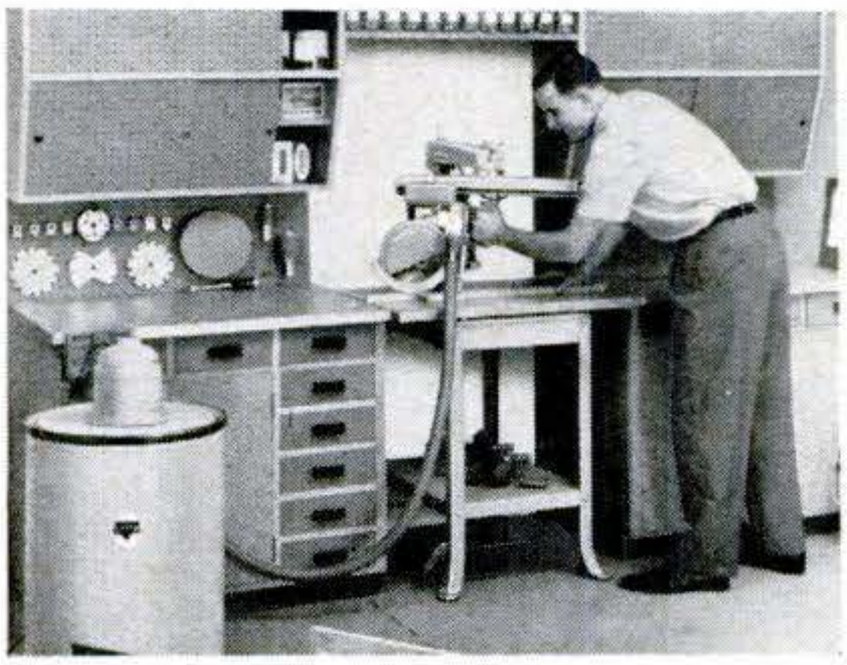
ROCKWELL-BUILT

DELTA HOMECRAFT® POWER TOOLS

THE "NEWEST LOOK" IN THE WORLD'S FINEST POWER TOOLS



DELTASHOP—The practical combination of four, full-size tools—saw, jointer, drill press and sander. Does 95% of all workshop jobs, yet takes a space only 3 feet square! Shown in specially designed under-the-stairs shop.



DELTA "900"—most powerful All-Purpose Radial Saw workshop tool ever built for home use. Shown in compact shop you can build in basement or garage. Notice Delta Dust Collector which you can use with any power tool.

featuring exciting new styling by Raymond Loewy Associates, Inc.

Only Delta could bring you power tools like these! They're modern as tomorrow, with new convenience . . . new safety . . . new built-in skill . . . and new, clean, modern lines that reflect Delta's advanced engineering and quality craftsmanship.

Only Delta—with its unmatched power tool experience—could bring you the three workshops at the left, shops as modern as the New Advanced Design power tools shown in them! Mail the coupon for *free* plans, then build the shop that fits *your* space requirements. And *see* these wonderful new power tools at your Delta Dealer (listed under "TOOLS" in the Yellow Pages) or at leading department, hardware, and building supply stores. Ask about convenient terms to suit you.

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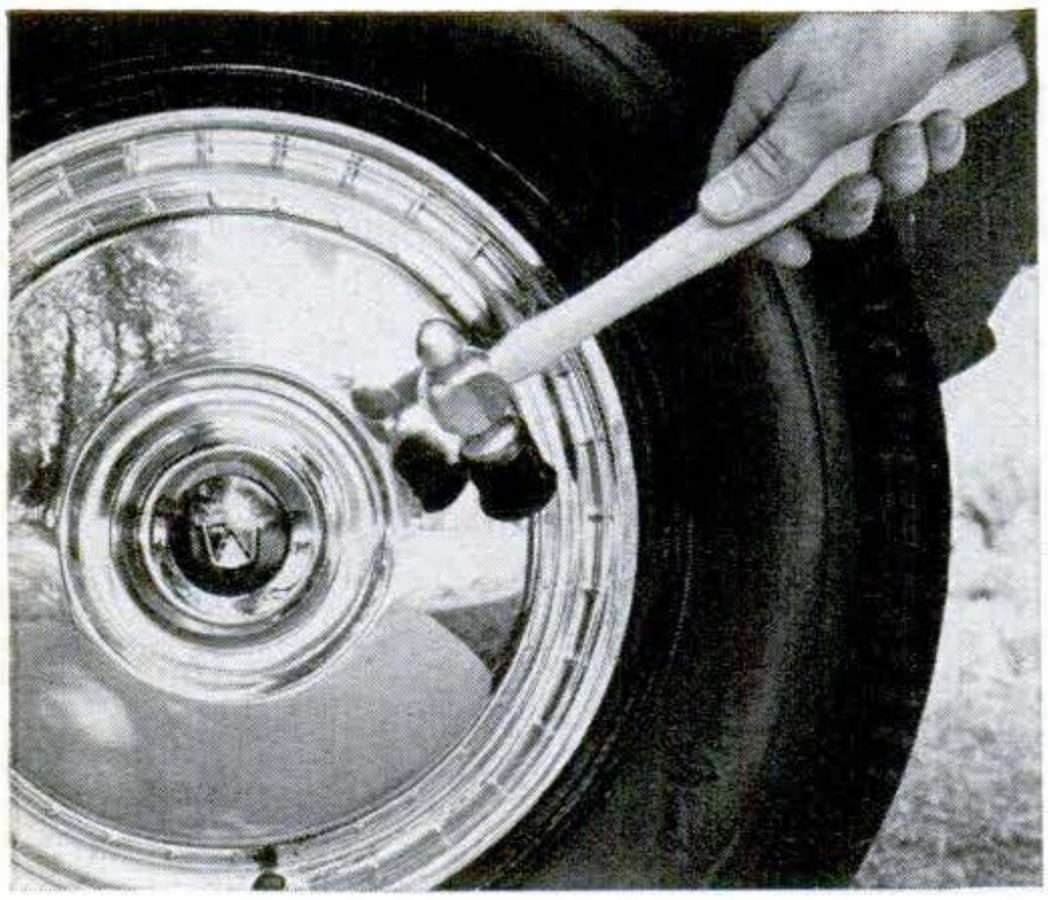
Short Cuts and Tips

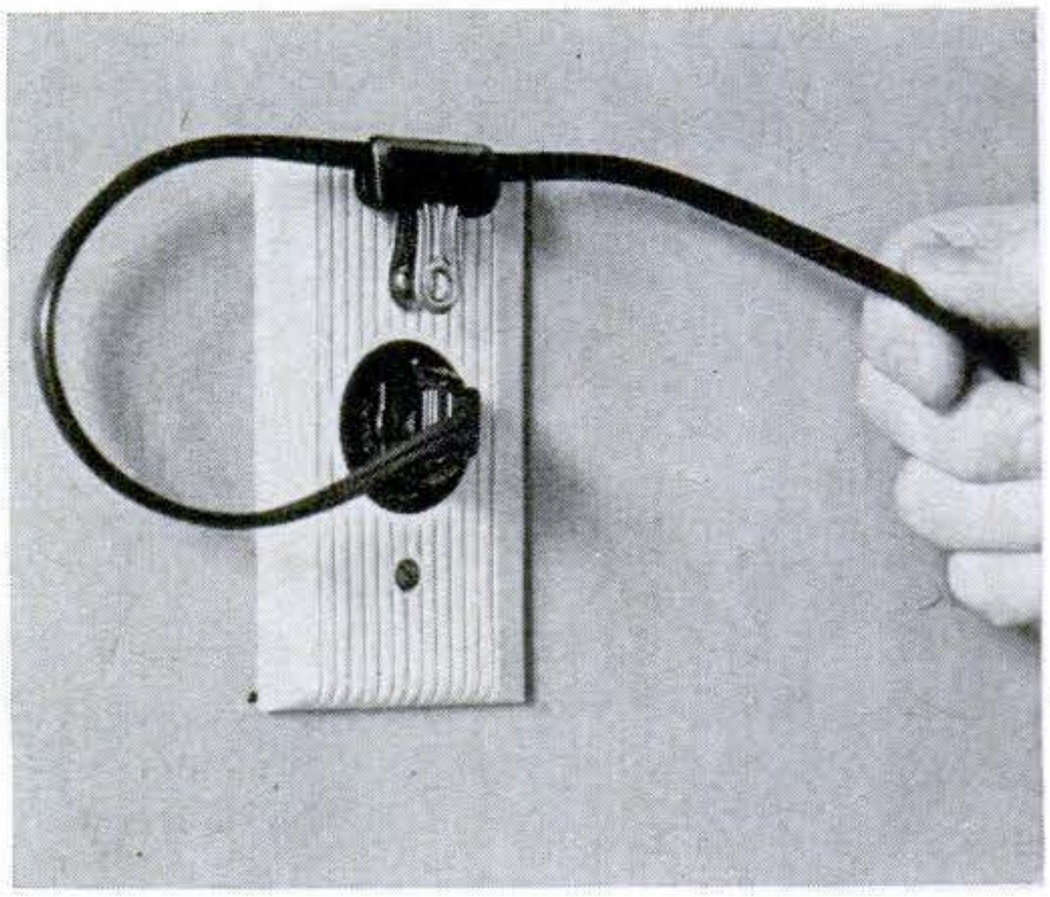
Flash Puts Light on Fuse Box

WHEN a fuse blows, there's light where you need it if you keep a penlight near the fuse box. A tool clip fastened to the box, or to a wall at the head of a cellar stairs, will hold it in an easy-to-reach position. Check the flashlight every few weeks to make sure that it's in working order.—*R. M. Woodson, Boston, Mass.*



Rubber Softens Hammer Blow

IF YOU reach for a hammer to tap a stubborn hub cap into place, there's always the possibility of marring the surface. To protect the cap, cushion the head of the hammer with a rubber crutch tip.—*Nels Olson, Washington, D. C.*



Clip Anchors Appliance Cord

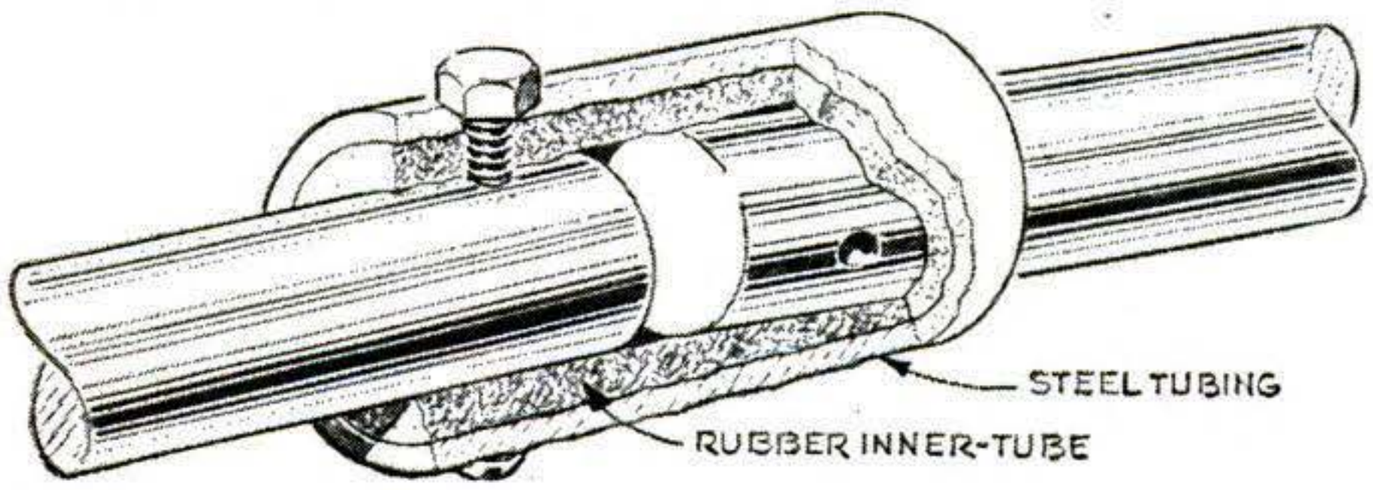
THE cord of a vacuum cleaner or other appliance won't pull loose from a wall outlet if it is clamped in a heavy-duty paper clip. Fasten the clip to the wall plate with one of the plate's mounting screws.—*O. A. Nelson, Seattle, Wash.*

Tubing and Rubber Serve as Flexible Coupling

WHEN the flexible coupling between the motor driveshaft and the reduction gear shaft on our washer wore out, a piece of steel tubing about 3/8" larger than the shafts served as a replacement.

I wrapped inner-tube rubber around the shafts to pack the space between them and fill the steel tubing. Then I forced the tube over the rubber packing. Holes to match those already in the shafts were drilled at right angles through tubing and rubber to take the connecting bolts.

The connector works like a universal joint, and the rubber cushions any slight flexing caused by misalignment of the shafts.—*Rex Bush, Columbus, Ohio.*



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These men chose their schooling— so can you!

Pvt. Robert K. R. Smith
Washington, D.C.
Graduate Woodrow Wilson High School

"I took the exact Radar course I wanted, thanks to the Army's technical training program for high school graduates. Now I'm working in electronics. You can pick an Army course that fits your interests, too—and only the Army guarantees you the training you want before you enlist. So if you want to be sure you get what you want, you ought to see your Army Recruiter and find out about this terrific program."

Pvt. Max LeBlanc
Lake Charles, Louisiana
Graduate, LeGrange Senior High School

"I had heard that the Army would let me pick the training course I wanted, but I was surprised to find they offered over a hundred different courses—and every one is guaranteed for you *before* you enlist. I chose Drafting and got really valuable training. You can find an Army course that will suit you, too. I'd suggest you see your Army Recruiter, because only the Army gives you your choice of technical training."

Seniors—get all the details on how high school graduates can choose their technical training before enlistment from 127 modern courses. Mail this coupon for your free booklet today. Or for immediate counseling visit your local Army Recruiter. He's listed in the phone book and will give you all the facts—at no obligation!

THE ADJUTANT GENERAL PS-11-57
Department of the Army
Washington 25, D. C.
Attn: AGSN

Please send me the free Army booklet telling how high school graduates can choose their technical training before enlistment in Modern Army Green.

Name .....

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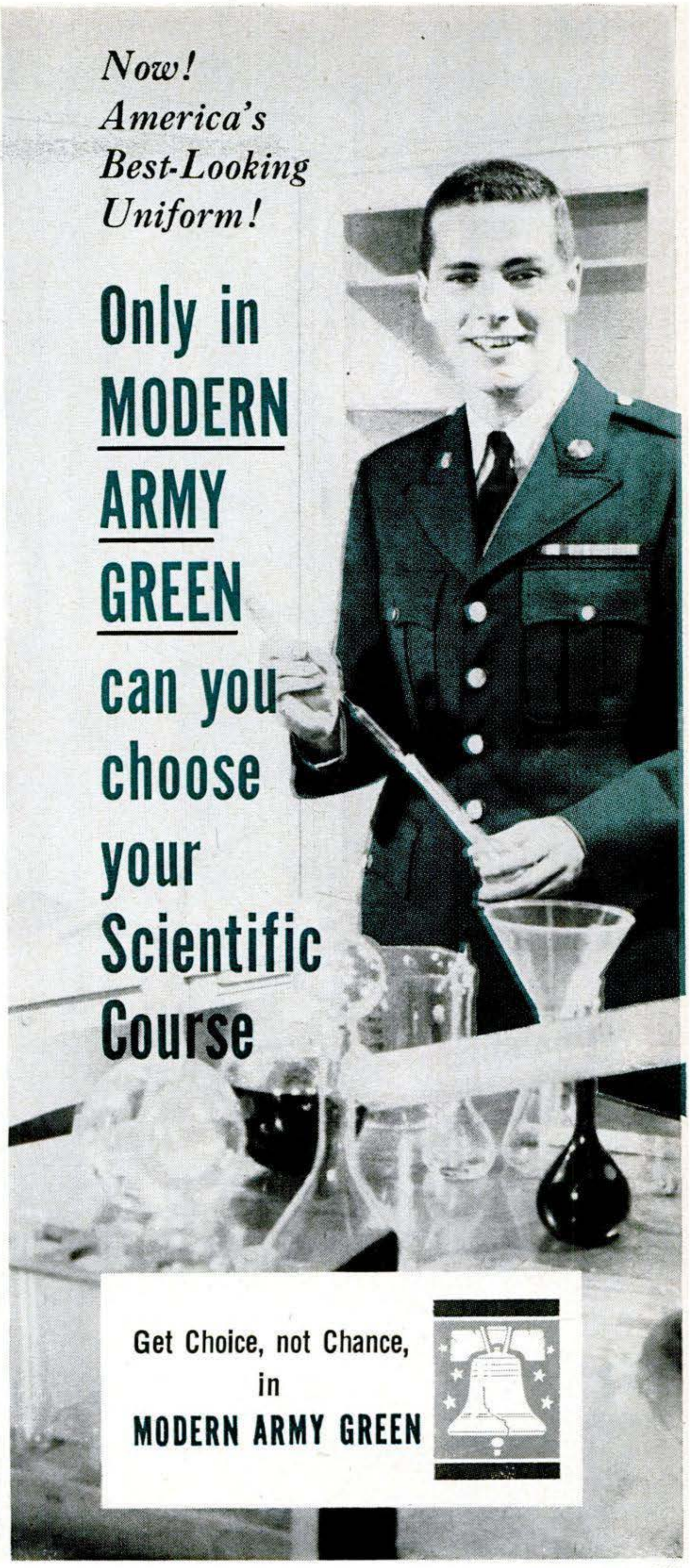
Date of Graduation .....



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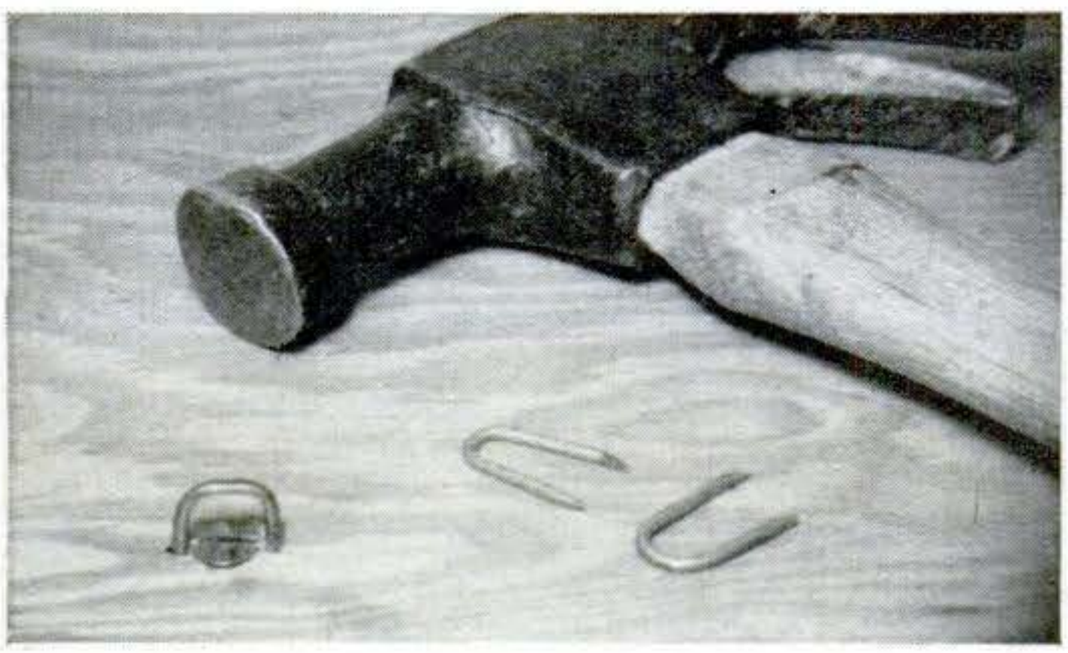
Short Cuts and Tips

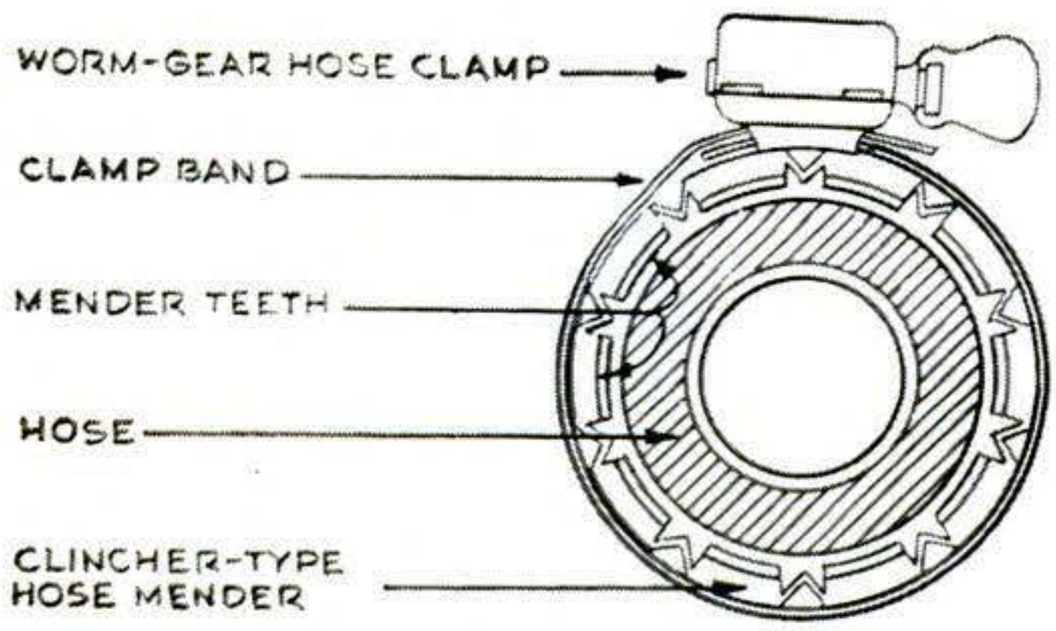
Music Stand Holds Binoculars

BIRD watchers, rifle-range fans and other binocular users will find a music stand a good steady rest for the glasses. Tip the rack to a horizontal position and lower the height of the stand so that the rack holds the binoculars at a comfortable eye level.—*R. M. Woodbury, Natick, Mass.*



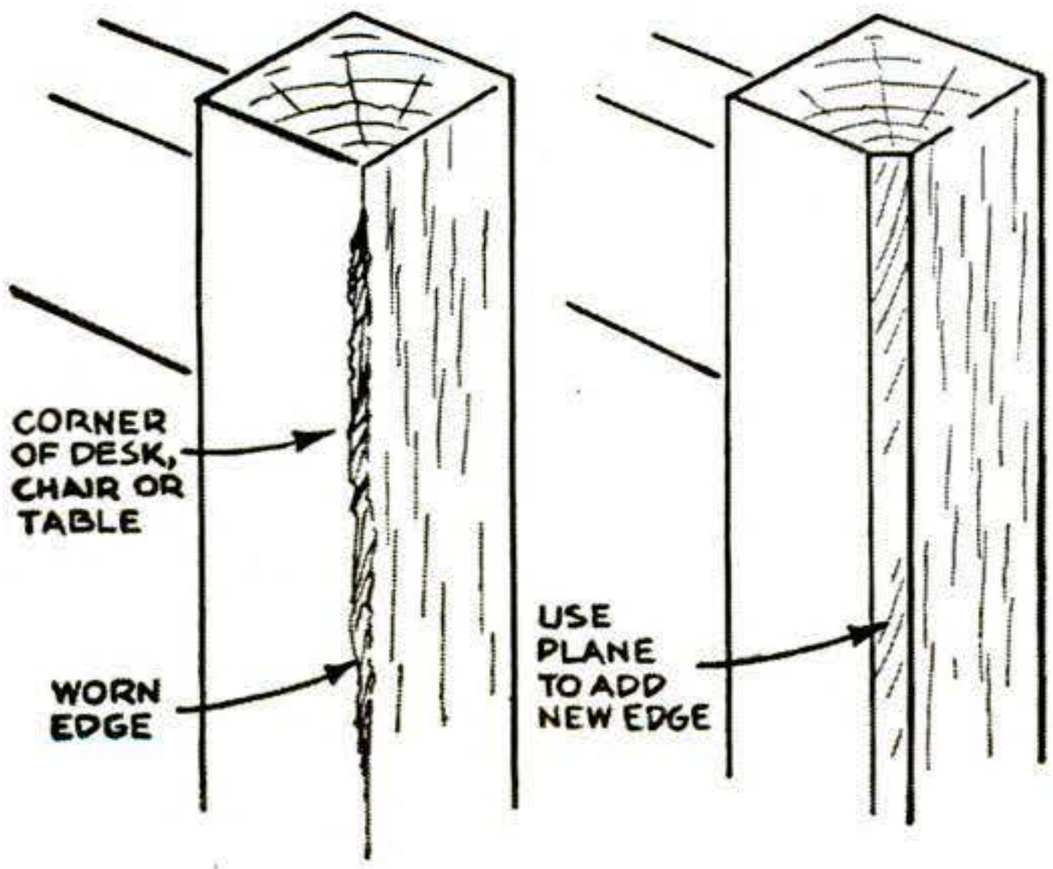
Staple Anchors Wood Screw

TO KEEP a wood screw from working loose once it's turned tight, drive a staple into the wood so that it straddles the head of the screw and then pound it down into the screwdriver slot. The staple will lock the screw so securely that it can't turn.—*John A. Coombs, Philadelphia.*



Hose Clamp Serves as Tool

WHEN my garageman's car-washing hose sprang a leak, he used a worm-gear hose clamp as a tool to attach clincher hose menders and couplings. Tightened around the mender teeth, the clamp forced them to grip the hose uniformly. —*Bruce D. Stewart, Winder, Ga.*



Planing Re-edges Old Furniture

BEFORE refinishing furniture that has had hard use, check the edges of desks and cabinets and the legs of chairs and tables. Where they show splintering or excessive wear, plane off the corners to provide a new surface. With a little care, you can do the same job with a chisel and sandpaper block.—*F. J. Shore, NYC.*

▶▶▶ADD a few drops of food coloring to wallpaper paste. When you brush it over the paper, you can see at a glance whether it is spread evenly and without missed spots.—*R. Bauman, Somerset, Pa.*

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NEW! MILLERS FALLS Router-Plane-Shaper

WITH REVOLUTIONARY NEW LINE OF LOW-COST ROUTER BITS

Built for professional performance

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No. 6826 Plane Attachment Set
$31.95

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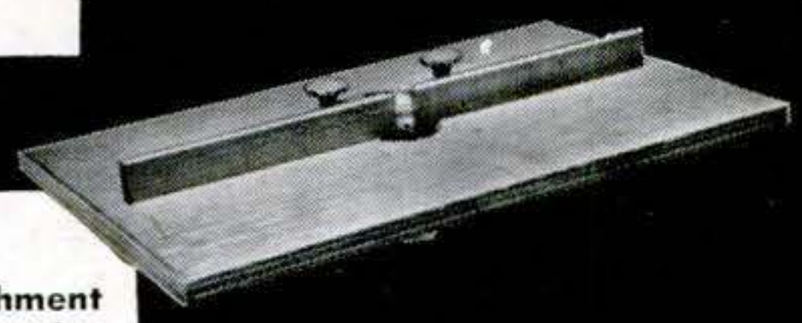
No. 6800 Power Unit and Base $39.95



SHAPER
No. 6818 Shaper Attachment with built-in motor mount
$19.95

3 TOOLS IN 1

Imagine! — an exciting new 3-tools-in-1 combination loaded with exclusive features to give professional results — yet priced to bring the adventure of fine cabinet-work within reach of everyone! It's a Router, a Plane, a Shaper! — that will do hundreds of jobs quicker and better—including dado cuts, moldings, fluting, rabbet cuts, dovetail joints, inlaying, planing and shaping. A real precision tool with plenty of power and speed, that anyone can use!

Plus . . . a revolutionary new line of 17 popular Router Bits, made of Special M-2 High Speed Steel — faster, longer-lasting — at 1/3 less cost than other types.

See and buy the Millers Falls Router-Plane-Shaper and its complete line of attachments at your favorite dealer's . . . or write us for name of qualified dealer nearest you.

CHECK THESE IMPORTANT FEATURES

POWER UNIT ✓ Rugged 3 amp. motor ✓ Ball bearings throughout ✓ 30,000 R.P.M. for smoother, faster, cleaner cutting

ROUTER ✓ Large 6" dia. base and big hardwood handles for positive control ✓ Direct-reading scale for fine depth adjustment ✓ Exclusive micrometer-screw adjustment for control of cut location ✓ Extra long rods for long reach cuts ✓ Base and non-marking sub-base take all popular templet guides

PLANE ✓ Big 14" shoe ✓ Outboard arbor support ✓ Micrometer-screw adjustment for front-to-rear shoe and cutter alignment ✓ Direct-reading depth adjusting scale ✓ Notched quadrant for quick bevel cuts (−15° to +45°)

SHAPER ✓ 1/3 cost of comparable models ✓ Big work surface (24" x 7½") ✓ Built-in motor mount for quick, easy changeovers ✓ Accurate depth adjustment ✓ Adjustable fence ✓ Rugged 1" marine plywood table

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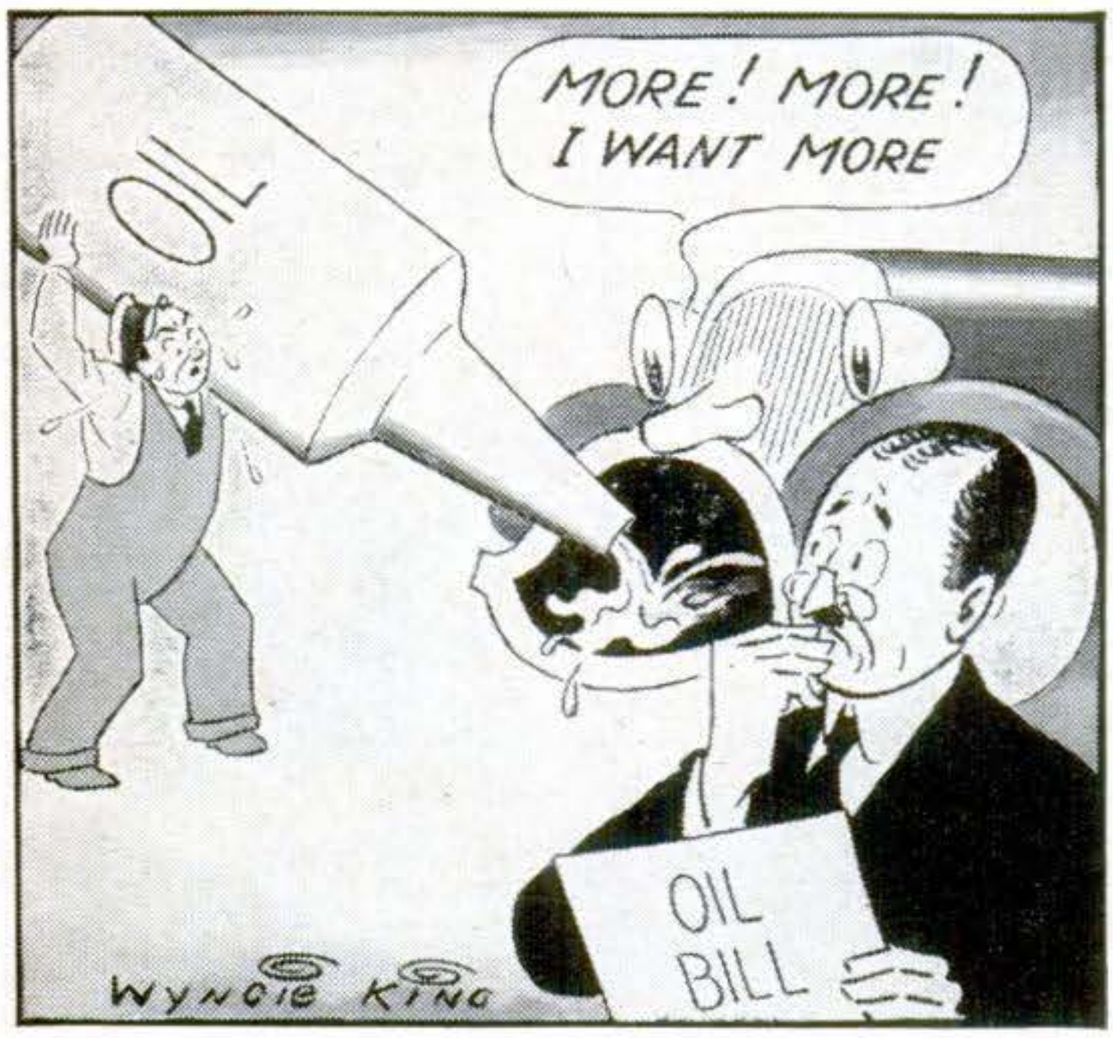

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PISTON RINGS

BEST IN NEW CARS! • BEST IN OLD CARS!

Buick: New Look, New Transmission

[*Continued from page 112*]

zoomed and cars grew heavier, braking became more critical. A careless driver could find himself faced with brake fade, caused by the heat of excessive brake use.

Last spring a team of five drivers began cruising the Los Angeles high-speed freeways in Buicks equipped with experimental brakes. Each man accelerated and braked for 200 miles a day, doting on the tough morning and evening rush-hour traffic. In the end they proved out what a program of proving-ground runs had also shown: that finned, bimetal brake drums did a fine job in pushing back the threshold of fade. The wear surface inside the drum is still cast iron, for durability and smooth performance; the finned aluminum housing outside acts to dissipate braking heat to the air.

The new bimetal drums are fitted only to the front wheels (where the bigger part of the braking effort occurs). The rear drums remain plain cast iron. All but the Special series of Buicks—which are the lightest ones—will come with the new drums installed.

Two Dynaflows. They have done something else about downhill braking. A new Dynaflow version, with three instead of two turbines, is rigged so that in one selector position it provides a handy degree of downhill retardation. Its selector quadrant reads P R N D G, with the "G" standing for Grade Retarder. Students of corporate lineage will spot the kinship to Chevy.

The regular twin-turbine Dynaflow, with a P N D L R quadrant, has been refurbished too. Up to this year its "variable pitch" stator has actually had only two positions, high and low. Living up to its name, the stator is now capable of an infinite number of pitches, depending on accelerator position. From a driver's viewpoint the car responds more sensitively to accelerator command; it no longer first lags and then leaps convulsively as the pitch is switched.

Big one gets bigger. For 1958, Buick has a new line of cars. To the Special, Century, Super, and Roadmaster there is added the Limited 700. It's basically the same as the Roadmaster 75 unveiled last spring, except that it's eight inches longer. The locomotive echo in the name seems apt.—*Devon Francis.*

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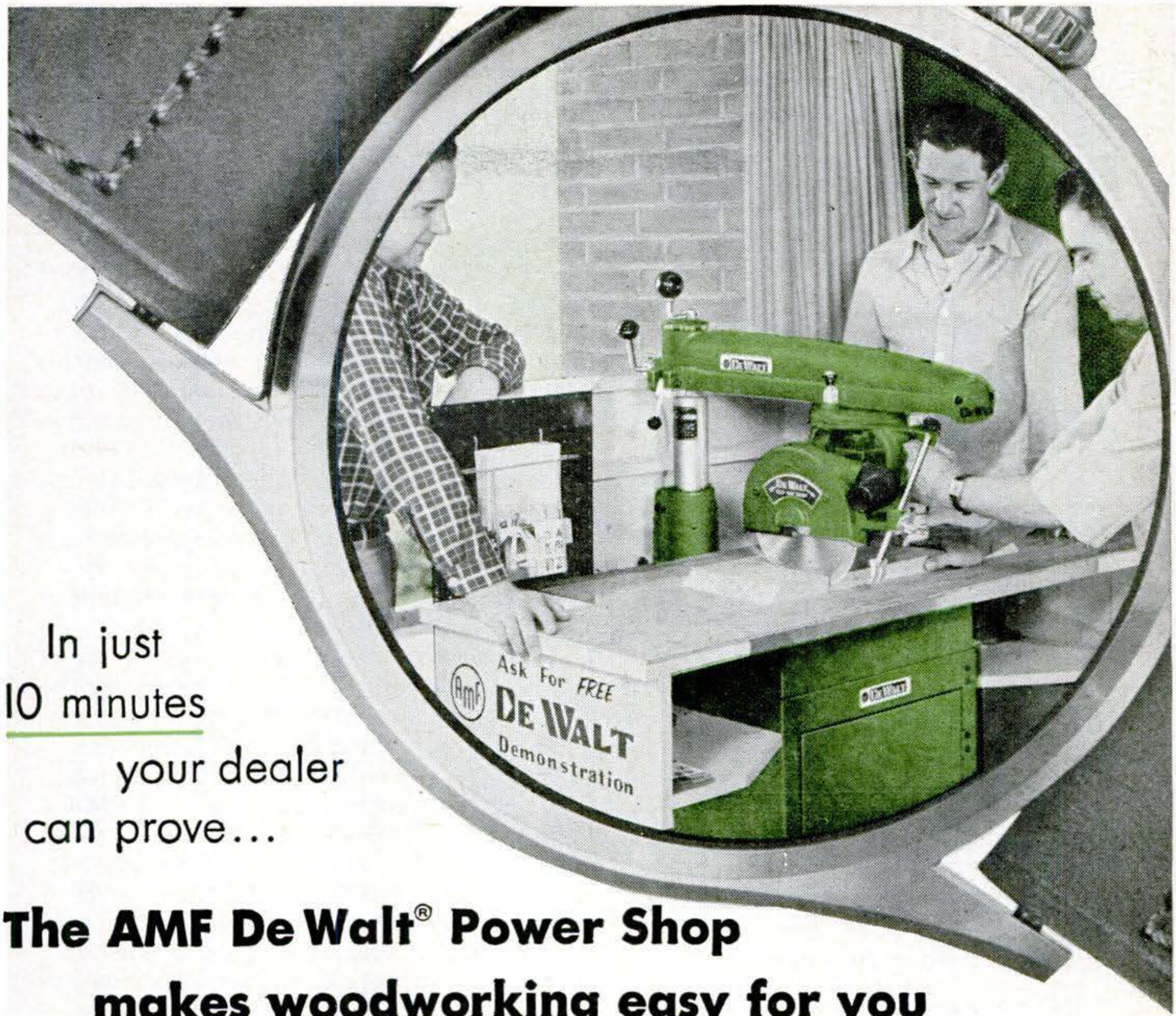

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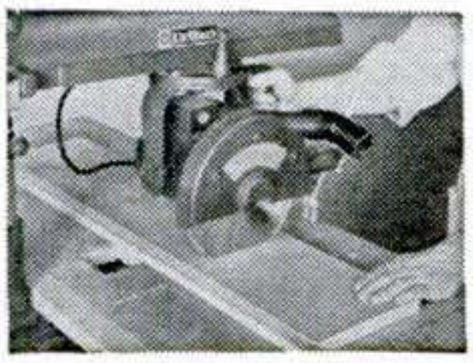

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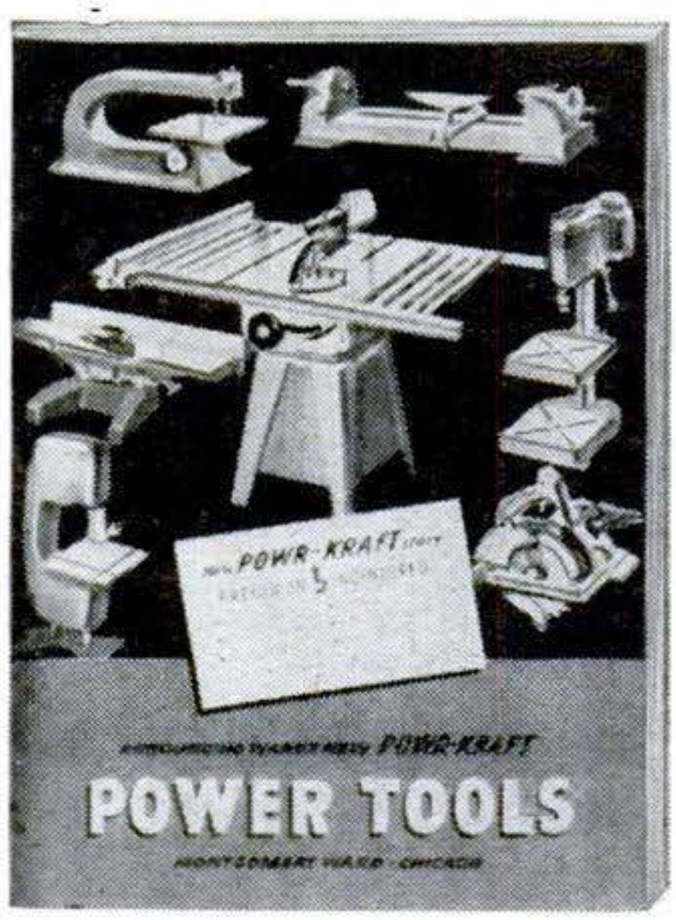

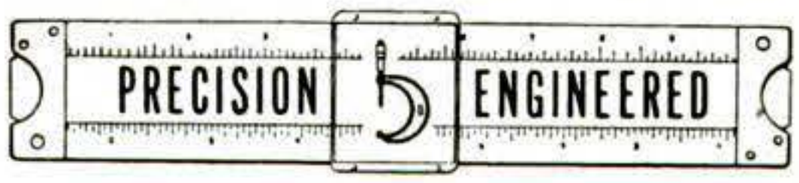

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Lincoln: World's Longest Car

[*Continued from page 116*]

the bigger of the heavy-muscled Edsel engines (PS, Sept., p. 242). The holes for the pistons are just bigger.

The car's styling borrows a bit from the Mark II, as does the plushiness of its interior fittings. Some sheet-metal "sculpturing," like that in the Edsel, Oldsmobile and Buick, has been done. (Jaded Detroit critics describe this bit of engineering as predenting the fenders.) The four-eyed headlights are canted, as though one of the car's forebears was Oriental. There are tail fins, but they're skimpy, like the Ford's.

Whatnots abound. The antenna, for instance, automatically goes up or down whenever you reach over and turn the radio on or off.

So the Lincoln, at long last, steps into the company of the Imperial and the Cadillac. It has been upgraded toward the Continental. The Continental, by the same token, has been downgraded.

The death of the Mark II leaves a sadness pervading the great new factory. In the plant garage, the last of the Mark II's off the production line stand regally aloof from the goings-on. The sales target for the car at its introduction in 1955 was 3,200 vehicles. Ford Motor sold 3,000-odd. Asked why the car had had so brief a life-span, a Lincoln sales executive said:

"I guess it was because the buyers got finicky. When they spent $11,000 for a car, they wanted this changed and that changed, and customizing just got too expensive."

For Detroit, simple elegance is too costly a luxury.—*Devon Francis.*

Playback Method Works Brain

THERE'S a natural kind of tape recorder built into your head, reports Dr. Wilder Penfield of the Montreal Neurological Institute. With gentle electric current he stimulated certain brain cells during surgical operations on patients conscious under local anesthesia. They reported "playbacks" of long-forgotten conversations, songs and the like.

Dr. Penfield theorizes that every experience—sight, sound, smell, taste—registers as a particular pattern in the brain. The pattern stays on, long after the experience seems to be forgotten.

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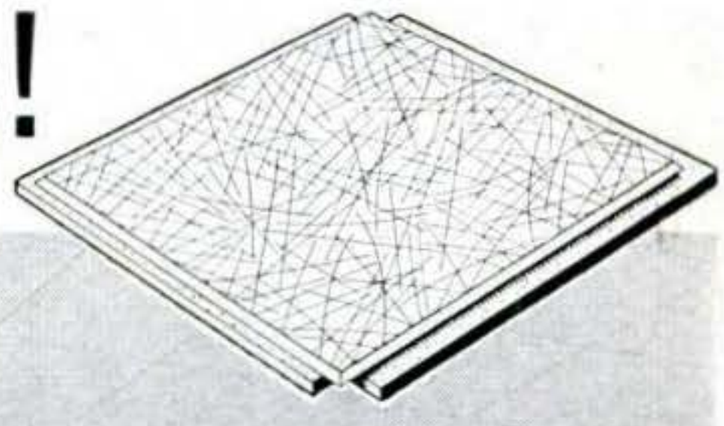
How to fit two boys into one room ...and keep 'em quiet, too!



Put two boys together and they're bound to have fun . . . and bound to make noise, too. But here's a dandy sound-conditioned room that lets 'em roughhouse all they want – yet hushes the noise they make. You can build a room like this yourself . . . even if you're no expert with a hammer and saw. It's easy to do, and costs less than you think. Here's how.

For the ceiling, use Gold Bond Decor Tiles – in the handsome new Jackstraw pattern (shown above). They're attractive, inexpensive, and make rooms pleasantly quiet – tiny spaces between the wood fibers actually soak up disturbing noises. Just nail or staple tiles to wood strips applied right over your present ceiling.

For the walls, use Gold Bond® Gypsum Grainboard Decorator Panels and Insulation Tiles. Decorator Panels come in four exciting woodgrain finishes, plus Knotty Pine. Go up in a jiffy, too. Saw panels like wood, or score with a knife and snap. To clean, just wipe with a damp cloth. Insulation Tiles come in rich ivory white, and can be painted if you like. Their interlocking edges hide nails or staples.

Want plans so you can start building? Write for free illustrated folder, "How to Remodel Your Attic," to National Gypsum Company, Dept. PS 117, Box 73, Buffalo 13, N. Y. Then see your local Gold Bond dealer. He'll supply everything you need – including helpful advice.

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Question 1

What's the EASIEST way to drive wood screws?

Question 2

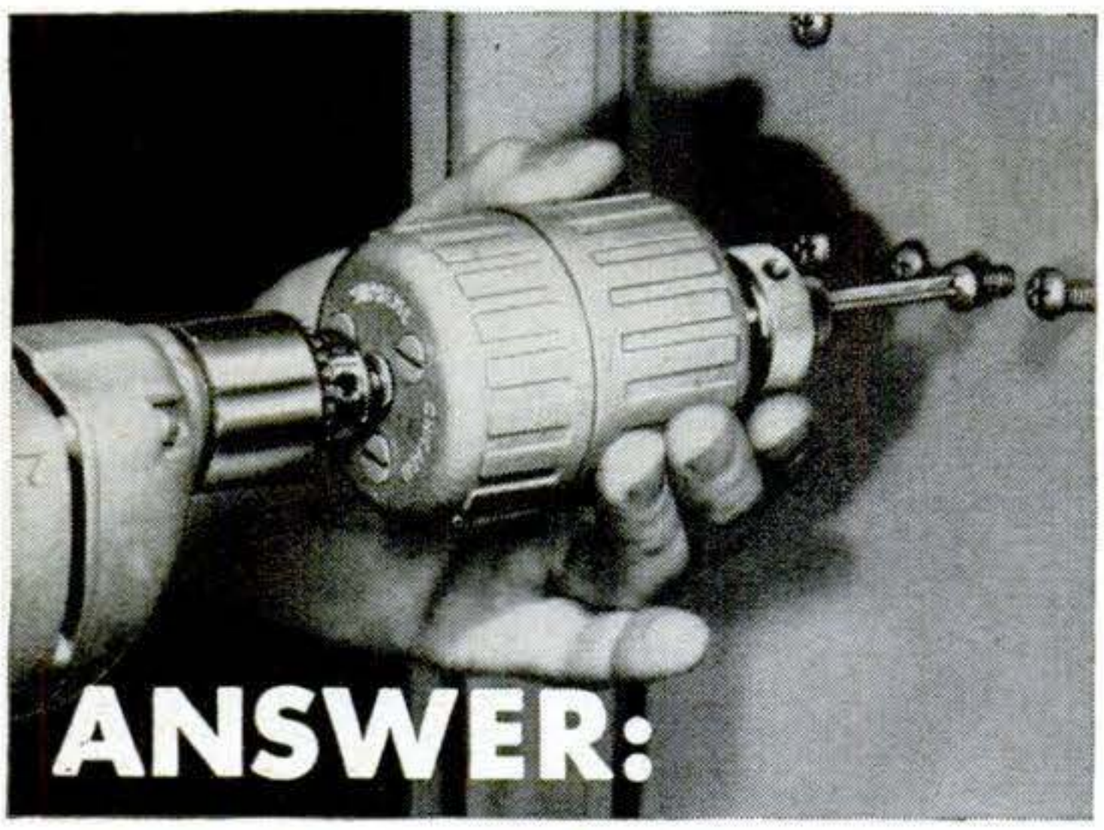
What's the EASIEST way to remove wood screws?

Question 3

What's the EASIEST way to run nuts or bolts on or off?

Question 4

What's the EASIEST way to use heavy-duty cutting tools like hole saws, masonry and auger bits?



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How Good Are the New Picture Tubes?
[*Continued from page 148*]

130 or 135 degrees is the next step. This would cut three or four inches off the length of a 21-inch tube, make the set fit in an ordinary bookcase.

2. A 150-degree tube is more difficult but not impossible. It would save only about two more inches, though. And it is as far as you could go with the present kind of cathode-ray tube.

3. Several types of 180-degree tubes are being toyed with for military uses. A deflection of 180 degrees sounds impossible but isn't—you bend the electron beam into a U turn, then use other circuits to scan it across the screen. The trouble is that these "other circuits" look hopelessly complicated.

4. A solid-state picture "tube" would eliminate the vacuum, electron beam and electron gun. It would be flat—a picture on the wall.

The 130-degree tube looks like a commercial possibility for 1961 or thereabouts. The 150- and 180-degree jobs may never get into your house because the more-promising solid-state screen should be ready first.

The solid screen is a flat piece of glass coated with phosphors that glow when excited by an electric field. If you imbed a crisscross network of wires in the glass, you can make the electric field different at different points on the screen and create varying patterns of light and dark —a picture. Screens like this are already used to display numbers on electronic computers.

The numbers on computer display screens don't have to change very fast, so this scheme works fine. Television is another story. The electric field at each point in the screen would have to change more than 1,000,000 times per second. You would have to switch from one wire to another that fast. This is impossible with mechanical switches. You could do it with an electron beam—and that puts you right back to a cathode-ray tube.

One possible solution is a compromise. Use the solid screen to present the picture. Use small, inconspicuously mounted cathode-ray tubes to do the switching.

Best estimate for putting the flat TV screen in your home: middle Sixties.

The world on your wall. Once they get the bugs out of that flat screen, TV

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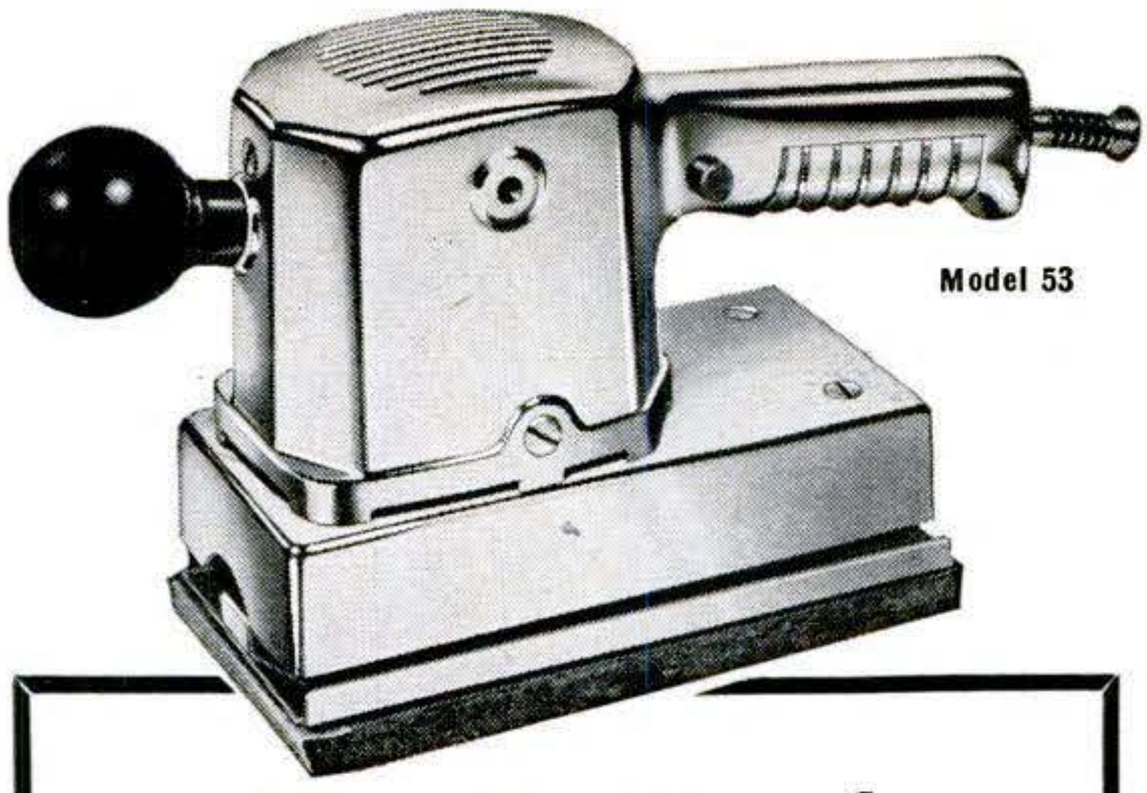

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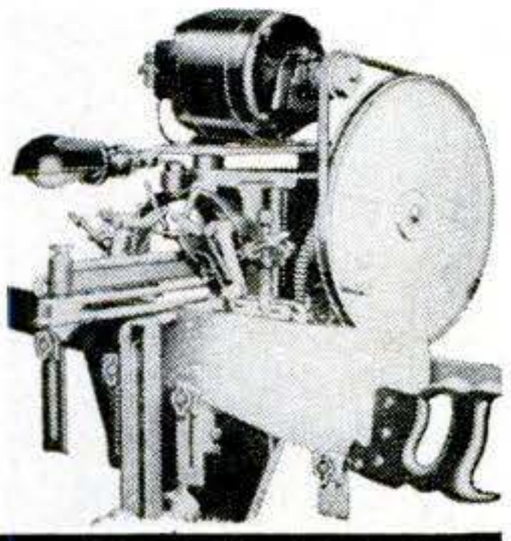

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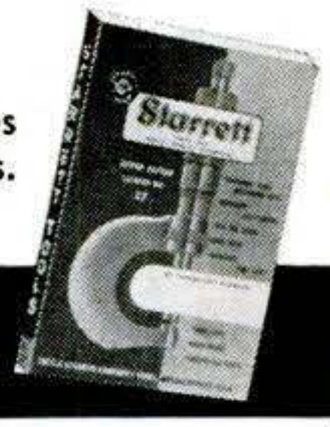

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How Good Are the New Picture Tubes?

will never be the same again. The screen on the wall suggests a far larger picture, home-movie size.

A jump to home Cinemascope would be a fundamental change, with far-reaching effects on the entertainment you could get. You would no longer feel that you were watching through a window. The frame around the picture would disappear from view and let you imagine yourself part of the picture, personally involved in the action.

The flaw in the big-screen idea is the TV image itself. It is made up of 525 separate lines with blackness in between. When the screen gets big, you see the lines and the picture breaks up, like a poor photoengraving in a newspaper.

Can you broaden the picture lines so the blackness in between disappears? Yes:

- The spot of light that traces the picture, now circular, might be made oval or better yet, rectangular.
- The spot could be wobbled up and down as it was moved sideways across the screen. Spot wobble is now used in some European receivers, and Westinghouse has recently publicized its research on the idea. Expect it to be tried, perhaps soon, on 24-inch receivers.

Real portables. A flat screen would be nice but not essential for a TV set that is truly portable—battery operated—and not just a table model with a handle screwed on. The first of these, trade rumors insist, will be out early next year. It will be partly transistorized, hoggish with batteries and expensive ($500-$600).

Why not fully transistorized portables, which would ease the battery problem? Ordinary three-buck transistors won't work at the high video frequencies involved in some TV circuits. There *are* high-frequency transistors now, but they're awfully hard to manufacture—you have to turn out a big batch to get a couple of good ones.

Another prospect for portable TV is Raytheon's new spacistor, which promises to work very well at high frequencies. The spacistor is a tiny crystal amplifier, like the transistor, but it uses an electric field to move electrical charges instead of letting them drift around (the electric field speeds the charges from one electrode to another, hence the ability to amplify high frequencies). END

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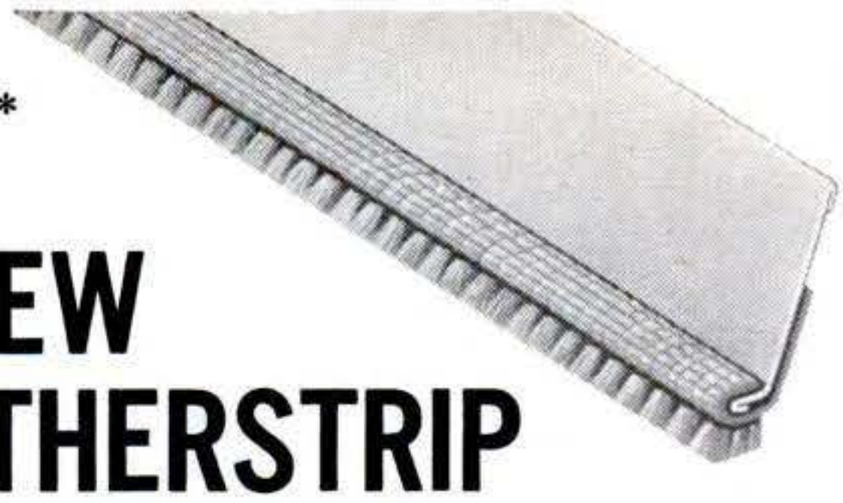

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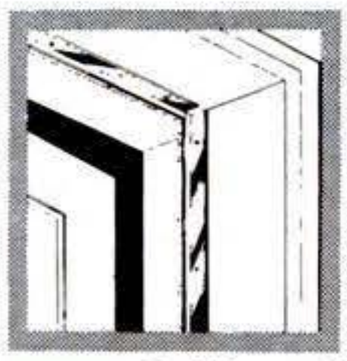

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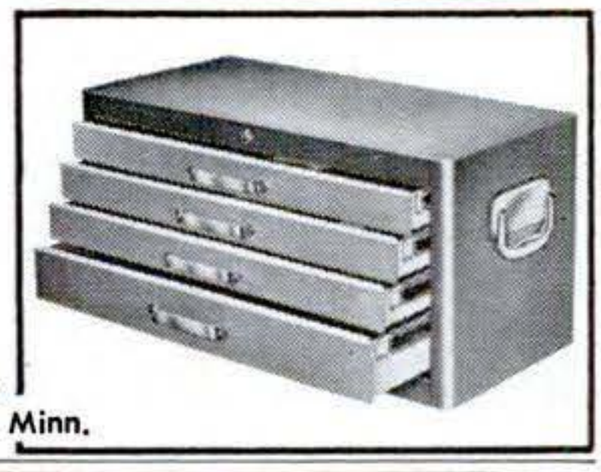

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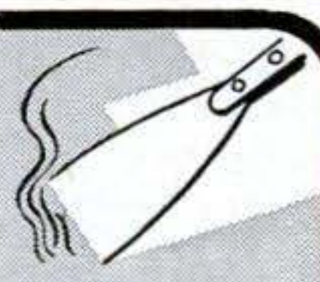

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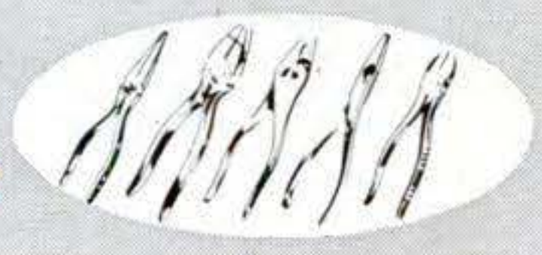

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The Journey No Man Has Ever Made

[Continued from page 151]

Hillary has been equipped with tractors, but he has also been working, in the mountains and glaciers, with men and dogs instead.

Hillary and Fuchs plan to meet about 500 miles inland from the Pacific. If and when they bring it off, it will be the most dramatic meeting since that of Stanley and Livingstone in Africa in 1871. It will be even more lonesome: None of the several thousand men, in the many Antarctic expeditions of this International Geophysical Year, will be anywhere nearby.

It will also be a reunion of Everesters: Hillary will shake hands with George Lowe, who was with him on the team that tackled Everest, and who is crossing with Fuchs. The reason for Lowe's presence: On trips in 1955 and 1956, to find from the air a possible route, Fuchs kept finding, instead, previously unknown mountain ranges.

Major supply bases, 300 miles inland from each end of the route, were established in 1956-7, to help make the worst journey in the world better in 1957-8. In addition, both Fuchs and Hillary will be supported by air: When the weather permits, Auster and De Havilland Otter planes will fly over both parties, radio information about the route ahead, and drop supplies (especially fuel for the Sno-Cats). Except at the Pole, it is doubtful that the planes will be able to land anywhere along the route.

All supplies needed were taken down in the winter of 1956-7 (the Antarctic summer) just in case this year's supply ships can't get through. Despite his careful arrangements, though, Fuchs still comments: "Plans may have to be modified in the light of what we shall actually encounter." The wind, which blows constantly with a velocity more than twice that of any other continent is a big reason: It can, even in the polar summer, bring a nine-day blizzard (like the one that killed Scott) at any time. In the summer it can also bring a warm blizzard: a storm with the temperature barely above freezing, when the snow and ice turn into a conglomeration of water and slush, and swallow up mechanized vehicles and even sleds.

In any one of those unknown 1,900

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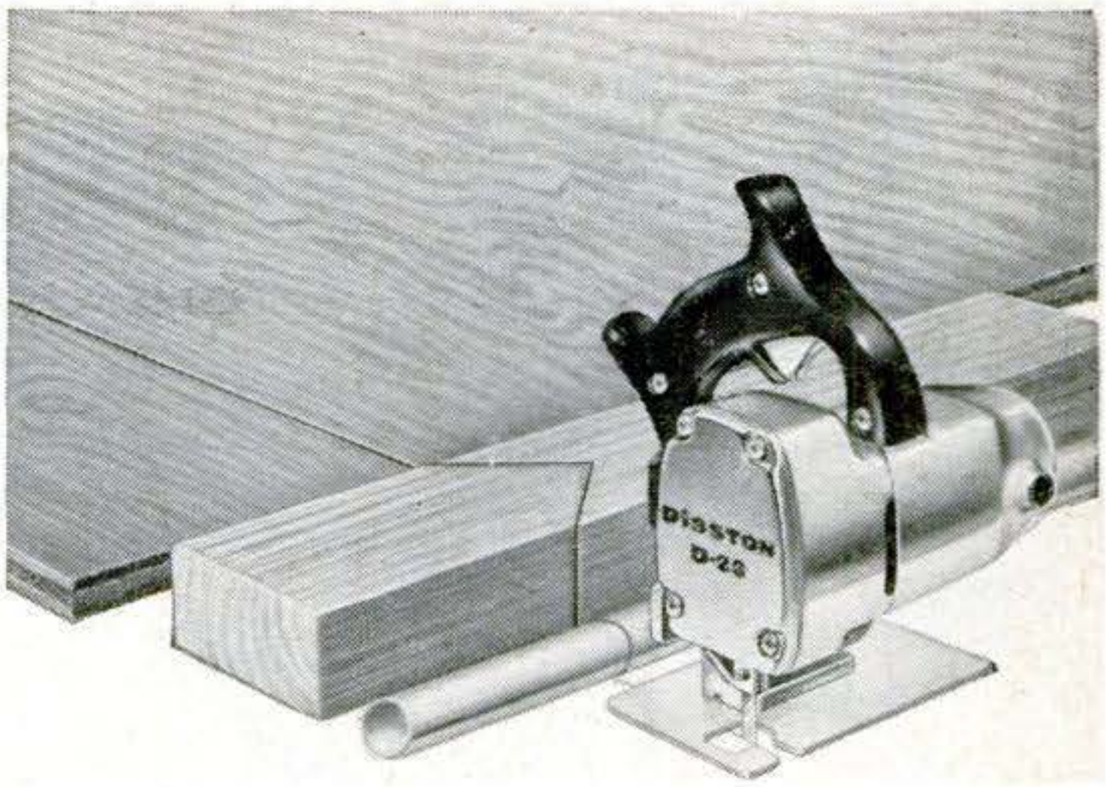

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miles, too, Fuchs can run smack into a place like the one Amundsen named the Devil's Battlefield. Here, said Amundsen, "the ice was so ground and broken that there was positively no place where one could set foot. It looked as if a battle had been fought . . . with blocks of ice for ammunition. They lay pellmell, on top of one another, in all directions, and evoked a spectacle of violent confusion." He said it was necessary to travel 10 yards from side to side to advance one yard through this chaos.

Here, too, Amundsen had to guide his laden sleds cautiously down ribbons of ice, with yawning chasms on each side of the ribbons.

If they do become the first men to overcome conditions like these and cross the Antarctic, Fuchs and company will have to scramble fast, next March, to board their ship, the Magga Dan, and get out before winter sets in and keeps them there another whole year—nothing to look forward to after what they will have been through.

If they make it, what then? Sir Raymond Priestly, the man who rode in that touring car with Shackleton 49 years ago, is today president of the British Association for the Advancement of Science. One of those who believes uranium and/or gold, silver and platinum is going to be found in the Antarctic, he conjures up a vision of a new California or Alaska gold rush—only colder and windier. He foresees a horde of individual wealth-seekers swarming in.

These—perhaps the hardiest of all prospectors to date—would be armed with Geiger counters and mine detectors, equipped with sleeping bags, windproofs (and long johns), and would be sure of themselves because of the information and maps brought back by Fuchs and his lads.

The only thing needed to touch off the rush, Sir Raymond feels, is the actual location of mineral wealth in the Antarctic. "Then, once a footing has been obtained," he says, "anything can happen in these days of technological man." Thus the 11 adventurous men who are now making the worst journey in the world may be only the forerunners of thousands more who will someday be taking the trip in their footsteps. END

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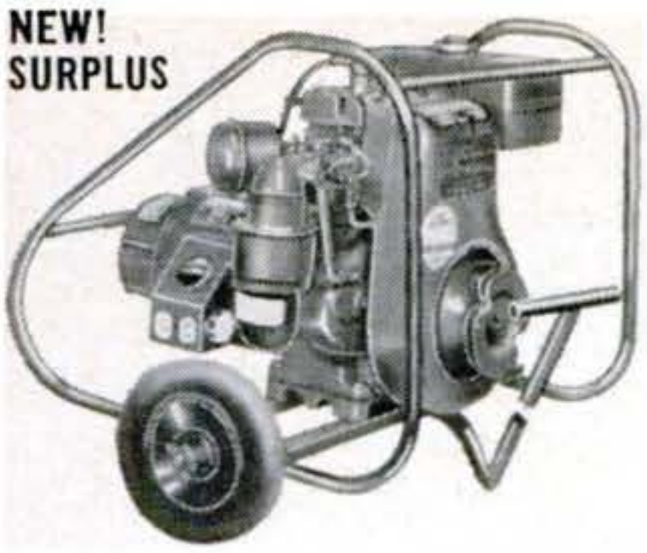

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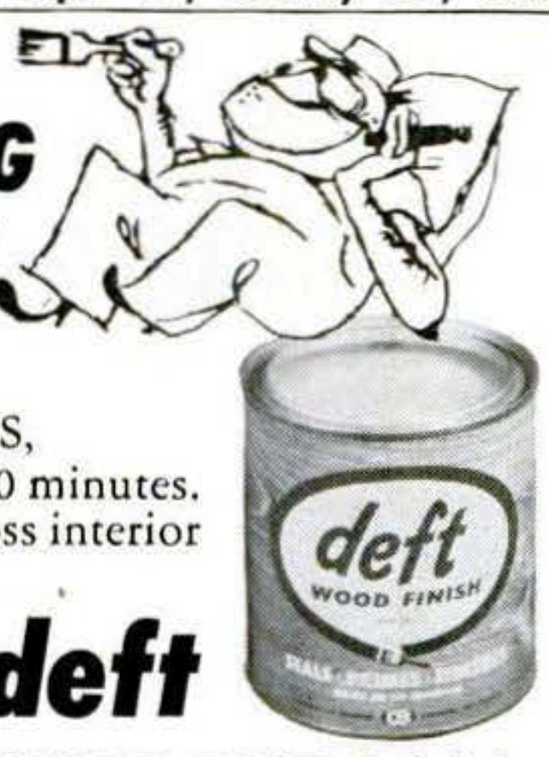

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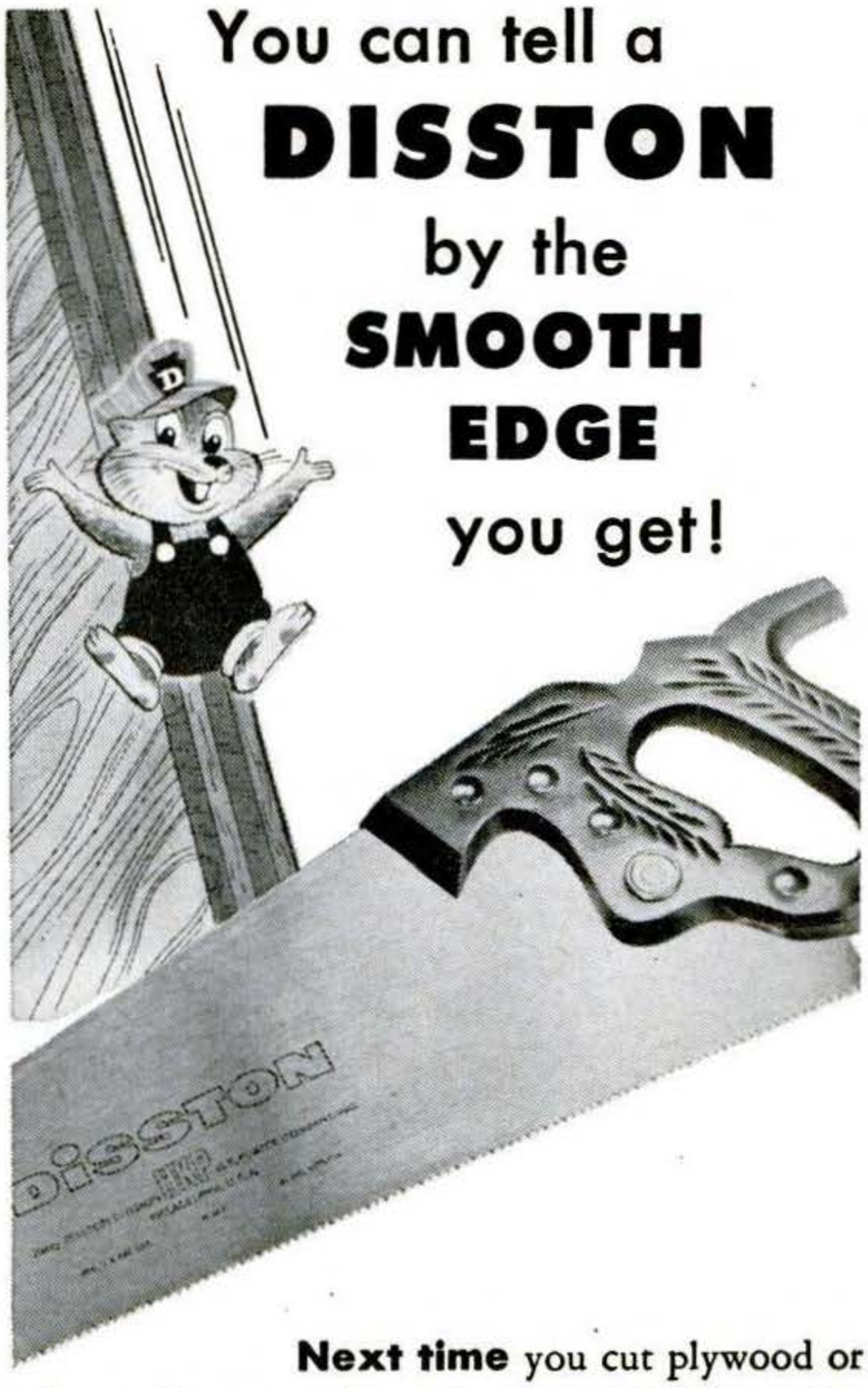

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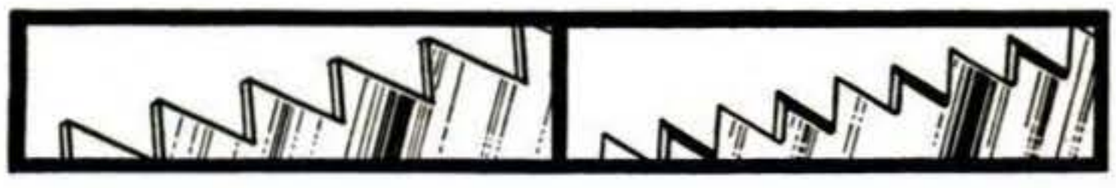

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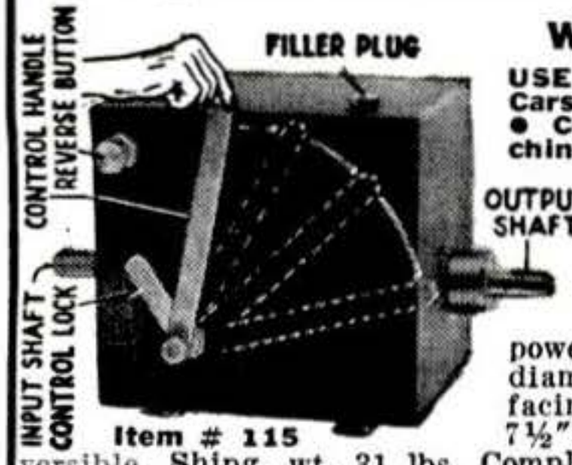

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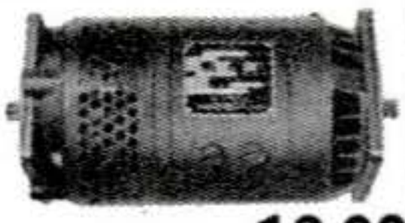

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How Good Are School Science Labs?

[*Continued from page 157*]

Half an hour later, the children found the oven dowel loose, the refrigerator dowel stuck tight. They had proved for themselves one theory was wrong: Heat didn't make drawers stick. But what did?

Some subtle questioning from teacher prompted one bright lad to suggest, "The weather is different in the summer. It's not just hotter, it's stickier."

This led to a discussion of humidity—and another experiment with the dowels. One sample went into a covered plastic box with a saturated sponge, the other went into a similar box with some drying chemicals.

By the next day those children had learned what made drawers stick. More important, they had learned to wonder, to question, to experiment—and to keep trying until they found the answer.

What your youngster gets. The kind of lab instruction in your schools depends mainly on the teachers. You can judge the job they are doing by observing them in action and asking a few questions.

• Are they qualified? A high-school science teacher should have a master's degree and a certificate to teach science, not some other subject.

• Are they overloaded? Even the best-qualified teacher cannot plan experiments, guide students in original research projects, advise the science club, consult with parents and set up field trips if he has too many classes.

• What kind of lab manuals do they use? Good ones present real problems requiring ingenuity and resourcefulness.

• Do they inspire their students? Just listening to them in class reveals a lot. The teacher who says flatly, "Today you will learn the principles of osmosis as outlined on page 24 of the book," is doing a routine job. The one who says, "Yesterday we were wondering how trees can lift water up into their tallest branches. Today we're going to find out how right here in the lab," is leading his students to a sound understanding of science.

The final proof of any process is the product. That applies to education. If your youngster leaves his science class with active curiosity, eagerness to try and the ability to find things out for himself—that school has put him on the right road to the future. END

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[Continued from page 166]

talent for cabinetmaking, as you have, he'll have got that from you, too—but mainly because you've let him work alongside you without driving him or setting impossible standards.

So far as is known now, musical talent has a stronger heredity basis than most others. That's because some of the qualifications of a musician—a sense of pitch, for example, and the ability to recognize tones—are closely linked to physical characteristics, the kind most directly influenced by heredity.

If you've been an exceptionally good sprinter—or swimmer, tennis player, boxer, or ball player—your boy is much more likely than the youngster next door, whose parents never showed any aptitude for athletics, to be good here, too.

But the capacity for being outstanding in any line is not enough. Neither is interest or drive. Both are needed.

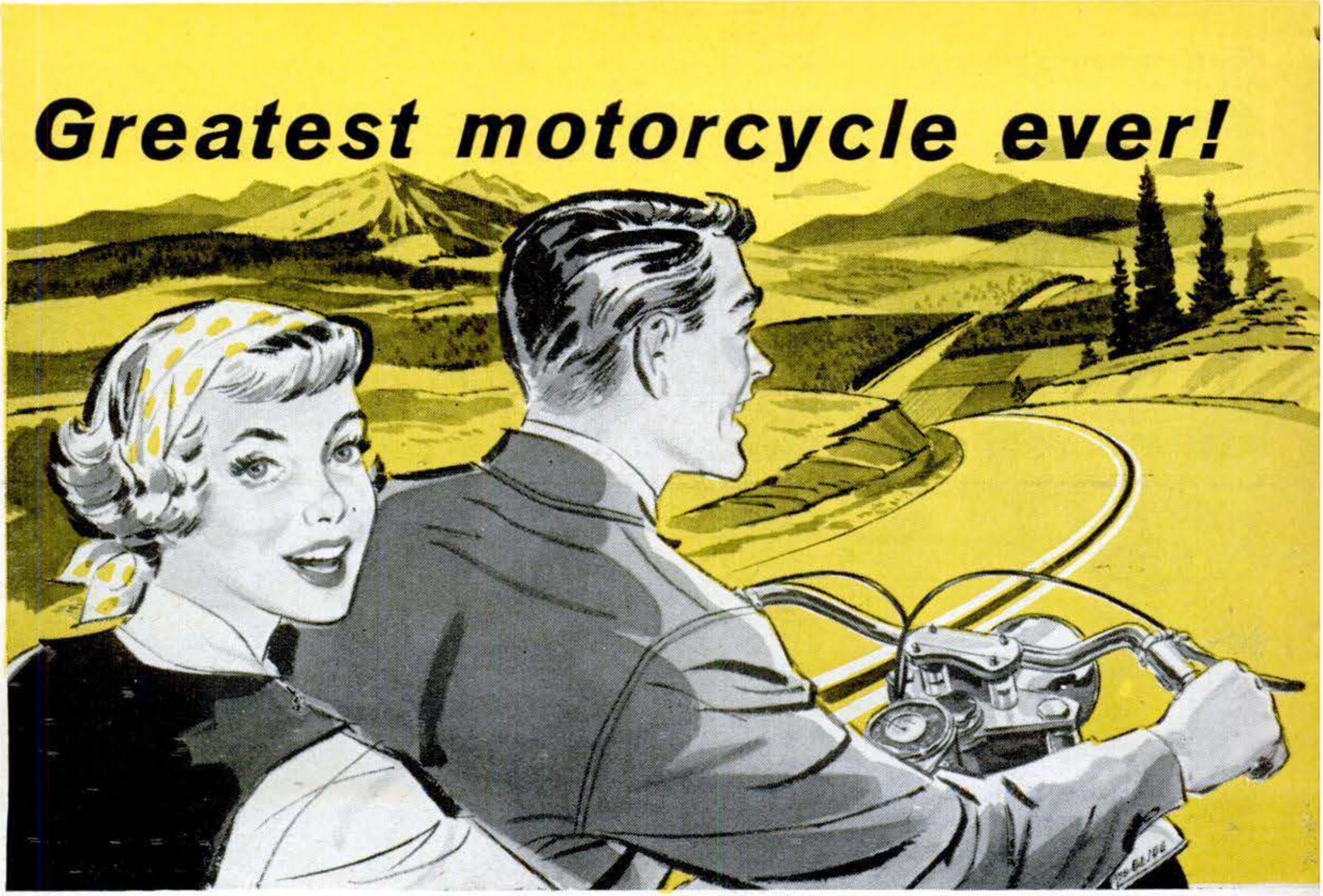
Suppose that little guy complains after school some day that he just can't "get" French. Your wife recalls that she was never very good at French herself. Has he inherited his difficulty?

If he's of average intelligence, probably not. "Brightness" in a particular subject seems to depend largely on interest. While intelligence in general is inherited, the youngster who "can't get" or "just hates" a certain subject may well have been influenced mostly by remarks at home or the attitude of his pals. Or maybe the teaching's at fault.

Mathematics seems to be different. Identical twins—unlike ordinary brothers and sisters—generally have the same aptitude for mathematics, even when they've been raised apart.

Our children inherit at least some of their personality traits, too, the study of twins indicates. Virtually all research so far has been on the gloomier side. For example, a British geneticist, James Shields, studying a group of London youngsters, was interested in such problems as moodiness, over-shyness, fears, hysteria, delinquency.

In the few cases where one twin had got into actual trouble with the law for stealing or some other delinquency, the other twin had, too. This was so whether



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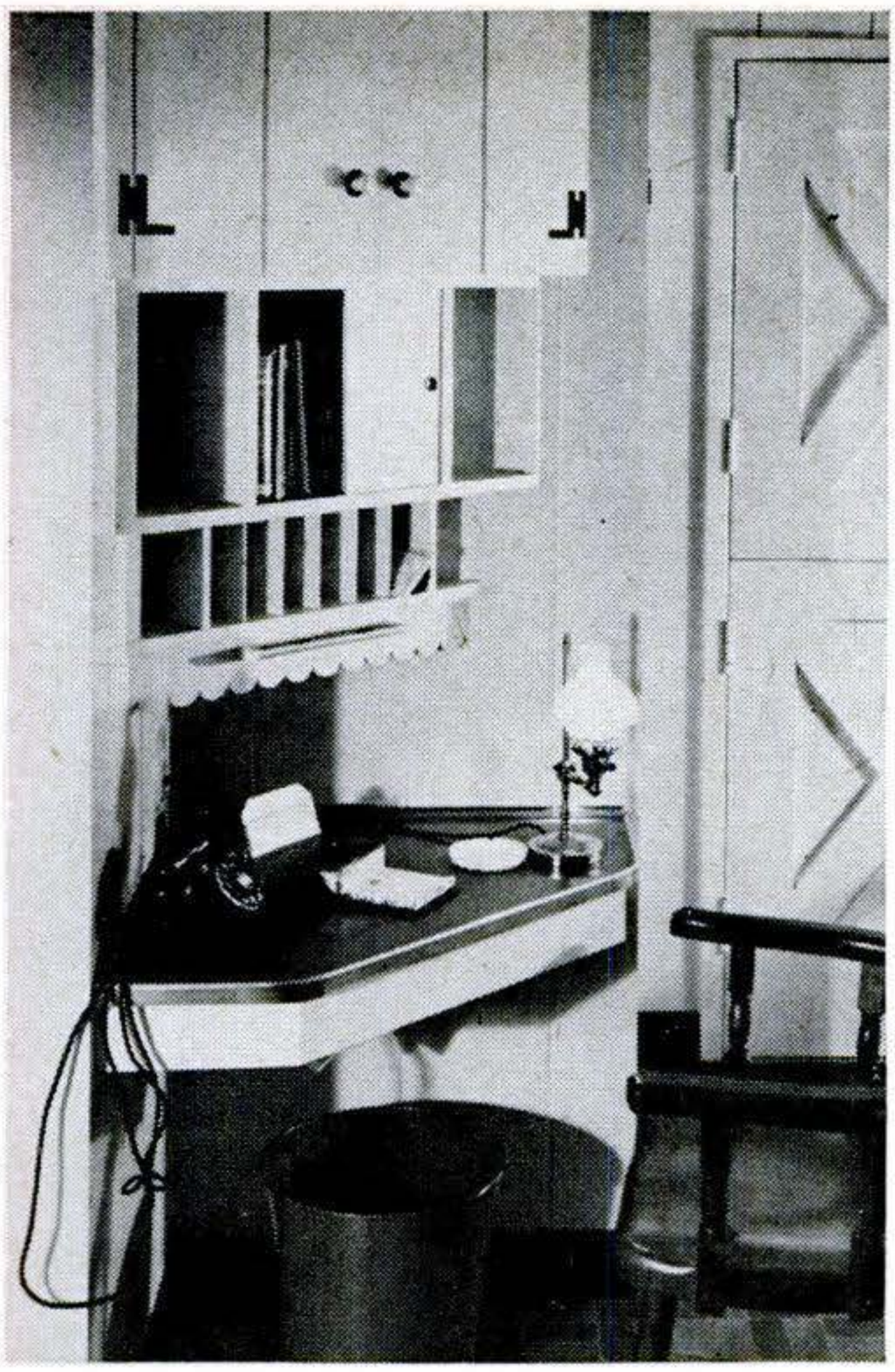

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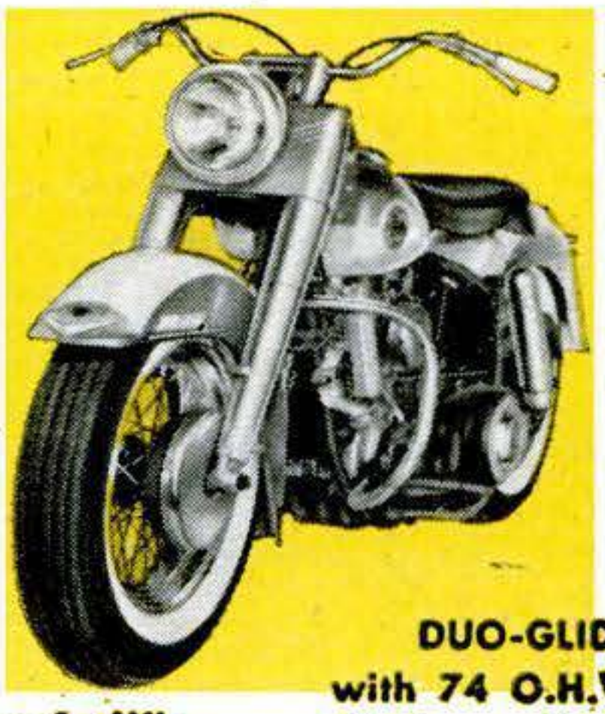

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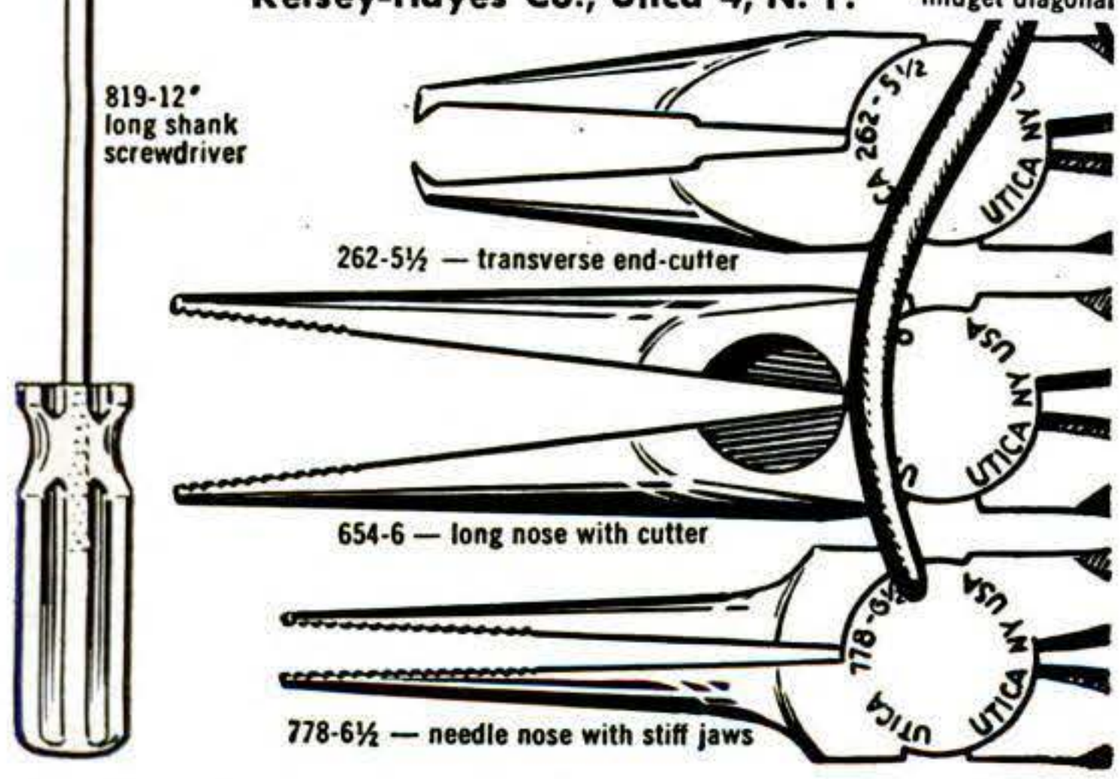
46-4 — midget diagonal



How Much Like You Will He Be?

the twins were identical or fraternal—suggesting that environment had been a stronger influence than heredity.

But in the other cases, both members of a pair of identical twins turned out to be much more likely to have the same personality maladjustment than both members of a pair of fraternal twins. Identical twins were affected the same way by a bad family situation; fraternal twins were not. Heredity, the investigator concluded, had strongly influenced the youngsters' personalities.

Dr. Franz J. Kallman, principal research scientist at the New York State Psychiatric Institute, has indicated the influence of heredity in the mental illness, schizophrenia, by finding that when one identical twin had it, in most cases the other twin had it, too. But with fraternal twins, in most cases, the second twin did not. It seems hereditary, then. On the other hand: some medical analysts say they have traced cases of "split personality" to childhood experiences.

Animal studies, too, are throwing light on whether our youngsters inherit parts of their personality. For example, Dr. J. L. Fuller, of the Jackson Memorial Laboratory, Bar Harbor, Maine, reports that some strains of rats make many errors in a maze; others, only a few. Some strains under laboratory observation run only a few feet a day; some run several miles. There are strains of mice that have convulsions when a doorbell rings, and strains that don't. Terriers and basenjis will fight harder for a bone than will such dogs as beagles and cocker spaniels.

Working with guinea pigs, other investigators have reported that even the sex drive—high, low, or medium—is inherited.

There's a danger, though, in applying these findings to man because human behavior, unlike animal, is powerfully stimulated by learning and custom and conscience.

Your child hasn't inherited any fully developed traits. He has inherited combinations of genes that will make the development of certain traits possible if the circumstances are right.

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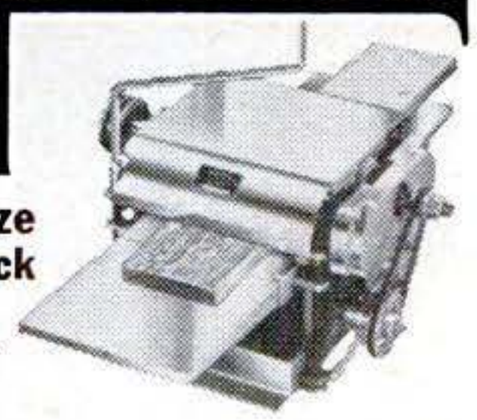

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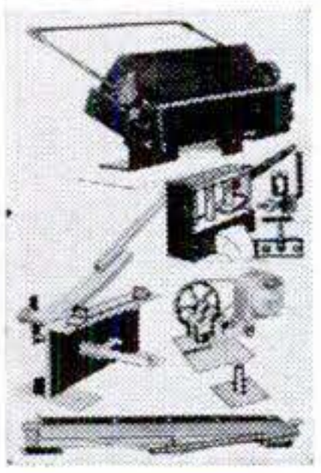

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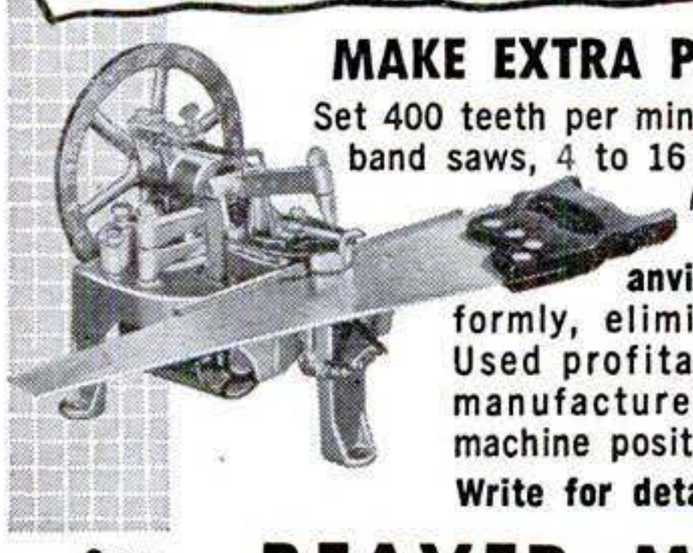

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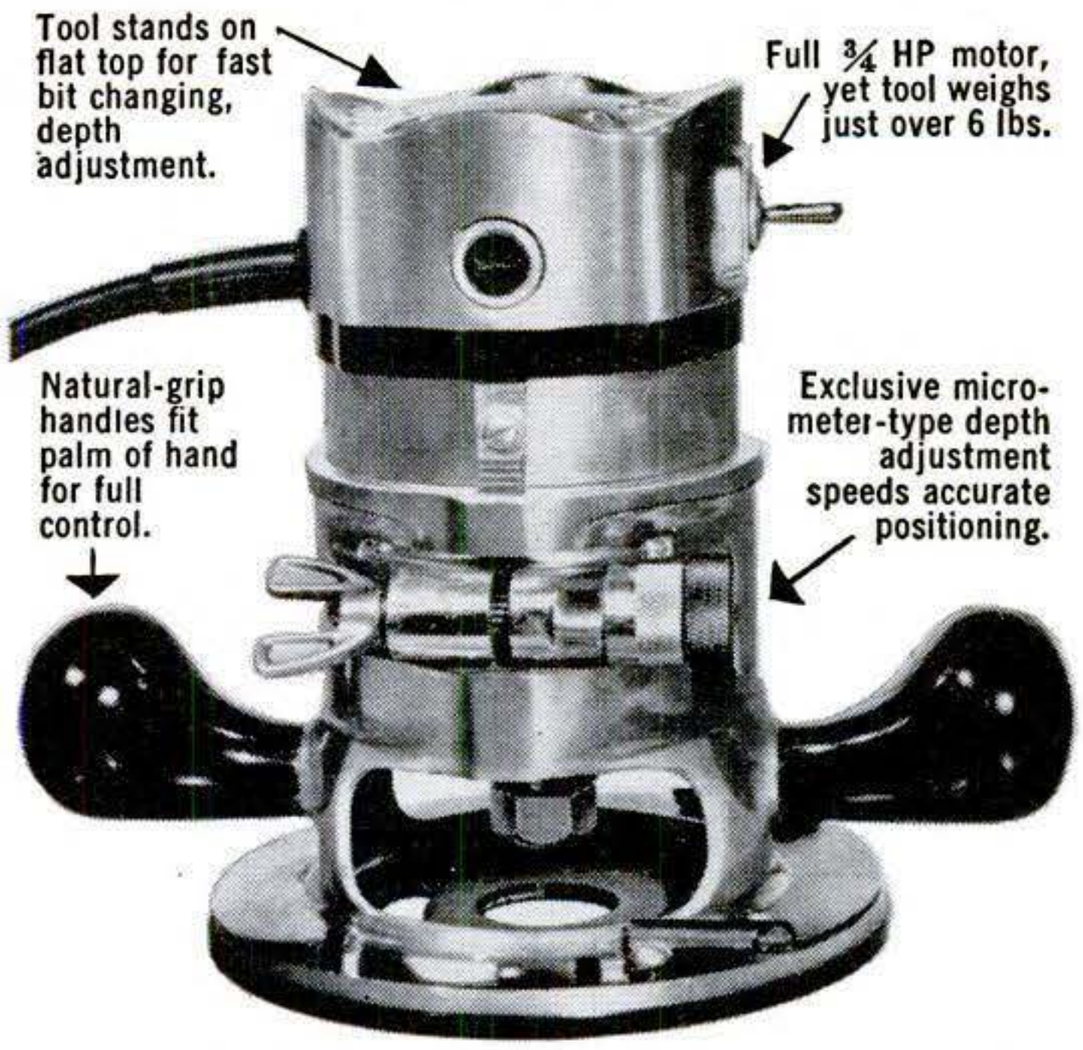

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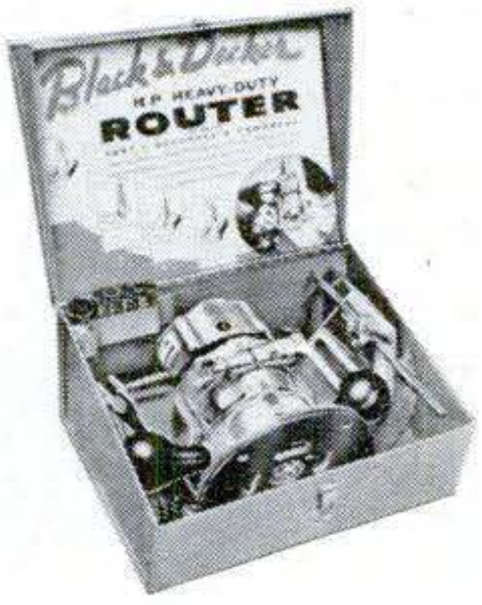

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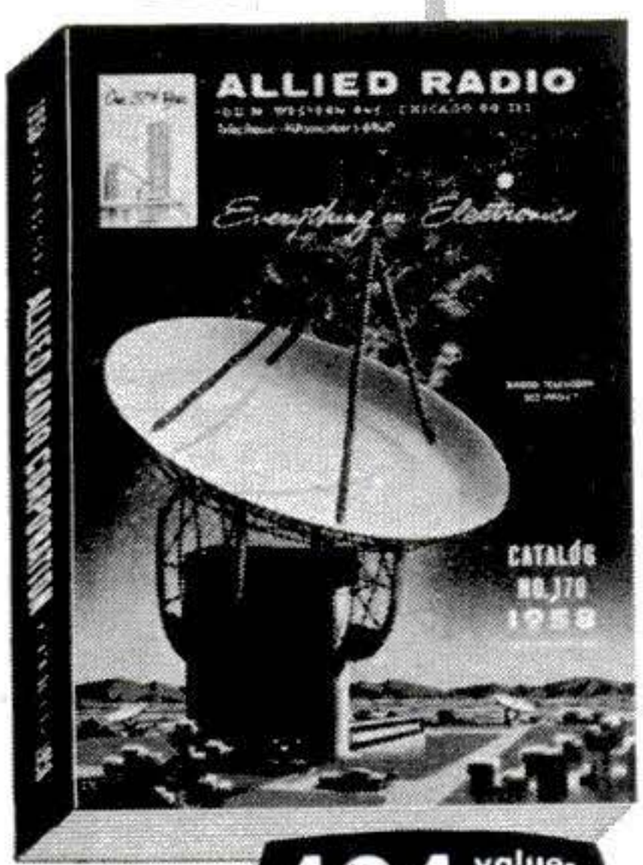

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How to Buy a Good Tape Recorder

[Continued from page 212]

ever, you have to wind it back onto the supply reel. So its spindle must also be driven—in reverse. And finally, a high-speed-forward drive is needed for those times when you want to skip to the tag end of a reel. Since both rewind and fast-forward are for skipping rather than playing, faster drives are generally better.

Two recording speeds. Nearly all machines now offer a choice of at least two recording speeds. A dual capstan speed is like a seesaw, with fidelity and economy occupying opposite seats. Multi-speed machines have been created to let you eat your cake and have it too.

Increasing tape speed will raise the upper-frequency limit of any recorder and reduce flutter and wow. Higher speeds are therefore preferable for musical recordings. The now-standard "high-fidelity" speed for home recorders is 7½ inches per second.

For not-so-high-fidelity work, on the other hand, lower speeds have more than enough sound range. They offer the convenience of longer play and cut the tape cost of recordings you want to keep.

Tape speed, it should be noted, is only one of several items that affect frequency response. Improved electronic designs, better tapes and coatings, and narrower magnetic-head gaps have all helped to increase sound quality at lower speeds.

Inputs. Every machine has at least one input jack so you can plug in a microphone or a "patch cord" from the loudspeaker of a radio, TV, or record player. But input connections vary. On some recorders the mike jack is separate from the radio-TV input (to make it possible for you to mix two sound sources on a single tape); still other models have separate input circuits for low-level magnetic-phono cartridges.

Nearly all recorders have an output jack to which you can connect an external loud-speaker. If you have a hi-fi rig and want to make use of its superior amplifier, as well as its loud-speaker, look for a second output connection. It's often called "high-fidelity output."

Operating features. Many of the working parts built into tape recorders have no direct bearing on sound quality, yet they can be very important in helping you get the most satisfactory service,

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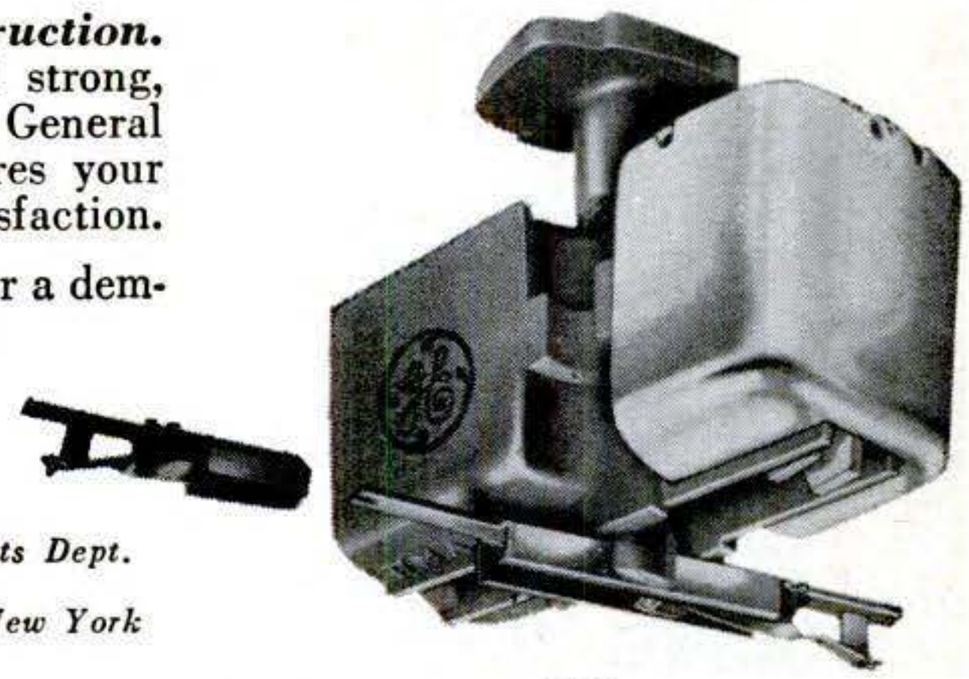

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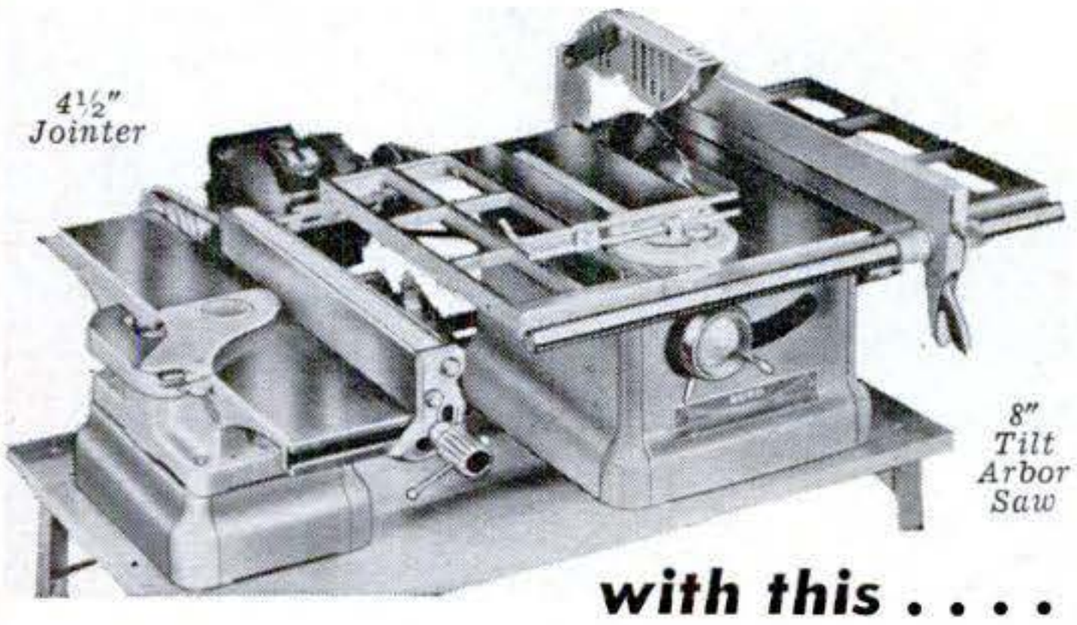

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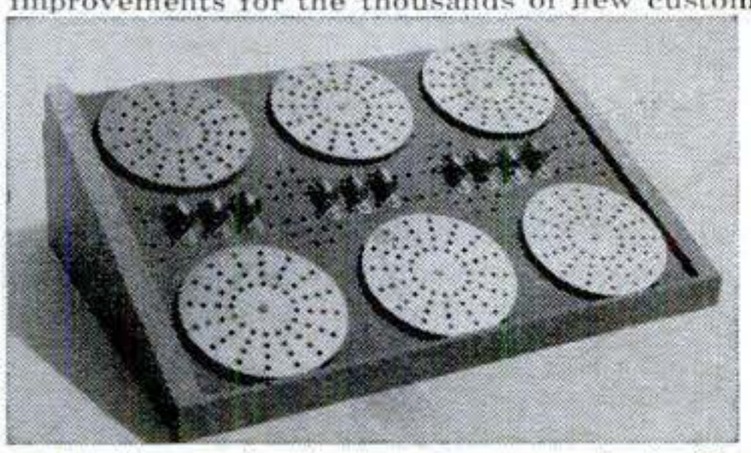

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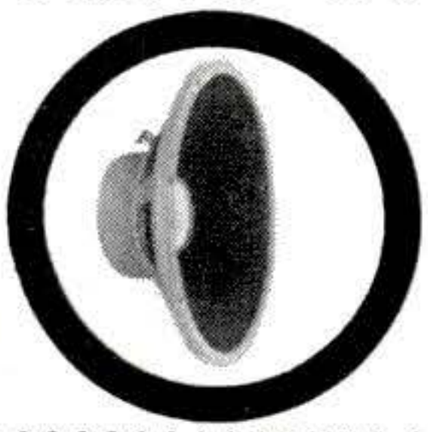

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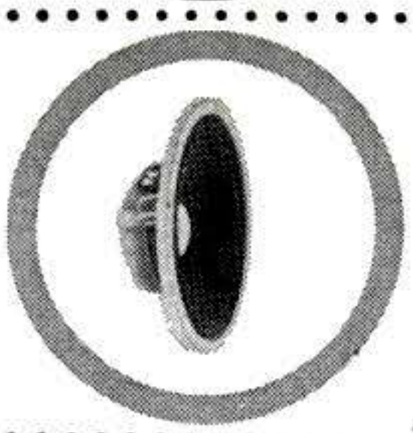

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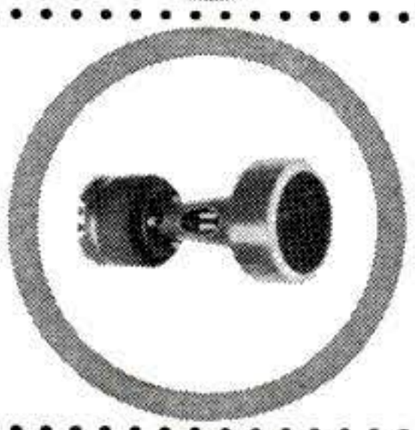

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over a long haul, from your tape machine.

The *level indicator* is a good example. For if you misadjust the volume control when you make a recording, or hold the microphone too close, or too far away, your tape will be noisy, distorted, uneven, or of poor quality.

To help you avoid such mistakes, every machine has some kind of recording-level indicator. The simplest one is a single neon lamp that glows when sound is overloading the tape. It gives minimum protection, because it doesn't distinguish between a setting that's too low and one that's just right.

Dual-neon indicators are better. One bulb (or one side of a dual lamp) flickers fairly steady when the recording level is okay. The other bulb (or side) lights up to indicate distortion. You can get more exact information about recording level from a tuning-eye indicator, a tube with a glowing face. For still more precise level control, you must go to the most expensive indicator, the VU (for Volume Unit) meter.

A *tape counter* is another worthwhile feature. Sometimes called a reel-revolution counter, a tape index, or—incorrectly—an elapsed-time indicator, it helps you quickly locate any section of a tape.

An *editing control* will prove handy if you use your recorder for dictation or note taking. It allows you to pause briefly, then resume again without resetting the controls.

The type of *roller release* built into a machine will only be important if you plan to tape broadcasts automatically by connecting your recorder to a clock radio or timing switch. To prevent slippage, the rubber roller that holds the tape against the capstan must exert considerable pressure. If left engaged when the machine is stopped, the roller may develop flat spots that can cause flutter, wow, or thump.

This won't happen often, because turning the stop knob disengages the roller on all machines. But for an automatic recording you preset the controls and let the clock radio make and break power-line connections. So if you'll do a lot of this work, look for a machine that releases its pressure roller automatically when power is interrupted.

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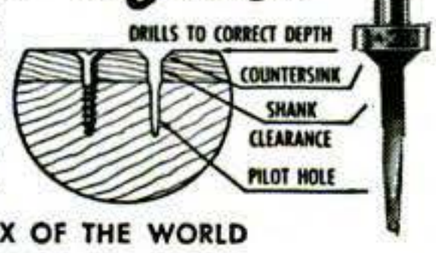

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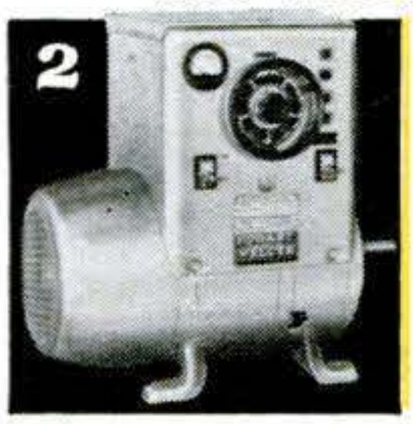

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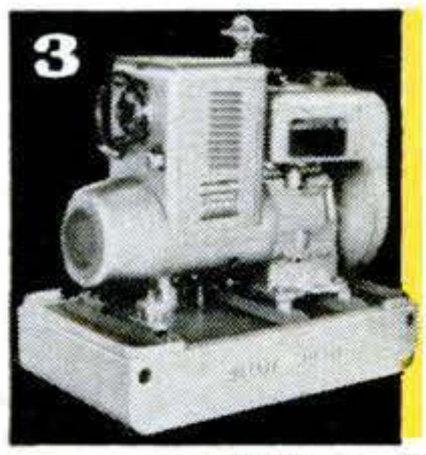

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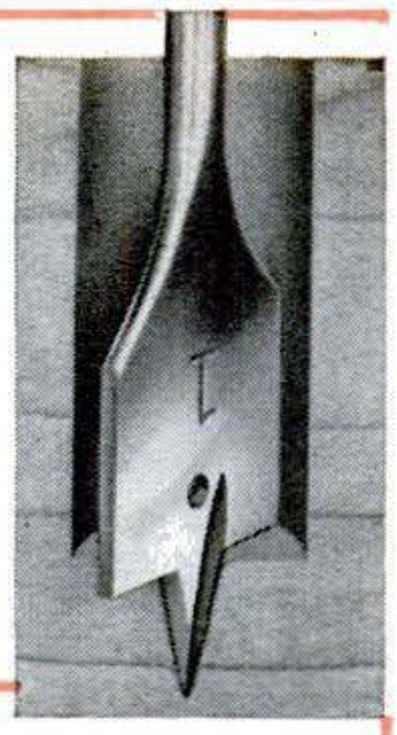

Fastest cutting new Speedbor "88" for electric drills. Bores 1" holes 2½" deep in just 60 seconds. Increases the average boring range of small power drills. Sizes ¼" to 1". Only $.75 each.

Fastest Boring 62T Hand Brace Type. Only 16 turns to bore 1" holes through 1" wood. Double cutter action. Sizes ¼" to 1½". As low as $1.

Fastest Boring Expansive Bit Type. Bore up to 35 standard holes with just one bit. Two sizes give ⅝" to 3" boring range. America's most versatile bit for home and farm. Only $3.80 for largest size.

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Free Booklet tells how to use, select and take care of wood bits. Many pictures. Write Irwin, Dept. 8D, Wilmington, Ohio.

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specs should help you narrow your selection to two or three models. But before you make a choice, try them out.

One good reason is that methods of measurement are not uniform throughout the industry. So some of the electronic data is not directly comparable. Moreover, the final test of any piece of sound equipment is how it sounds to you.

If you're concerned about musical quality, buy or borrow a roll of professionally recorded tape and take it along when you shop. A familiar piano solo makes a good test tape because flutter and wow have a very noticeable effect on piano music. Use a blank tape (the dealer will provide it) to put the machine through its other paces. Is it easy to thread? Are controls and indicators clearly marked, convenient to use?

If your recorder is going to be operated by several people, test it for the effect of careless or inexpert handling. For example, if it's possible to switch from rewind to fast-forward without first stopping the reels, try it and see whether the tape spills, snaps, or stretches.

How are the brakes? Do they stop both reels quickly? And do they take hold automatically, or do you have to manipulate them to keep tape from spilling? Some recorders handle easier than others. You'll get more use and pleasure from one that's gentle with tape. END

Traffic Light Marks Driveway

WHEN San Francisco scrapped its old "bird-cage" traffic lights in favor of modern types, a homeowner in neighboring Sausalito quickly salvaged one to adorn the entrance to his driveway. Set back from the property line, its Stop and Go lights face a street hardly a block long.

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- **IM Distortion....**Less than 1% @ 60W.
- **Harmonic Distortion....**Less than 1% 20 cps. to 20,000 cps.
- **Frequency Response....**±0.5DB, 20 cps. to 20,000 cps....±1DB, 7 to 70,000 cps.
- **Sensitivity....**1.5 volts rms. for 60 watts.
- **Damping Factor....**choice of 15 or 30 by a switch.
- **Hum and Noise Level....**85DB below 60W.
- **Hum Nullifier Control which compensates for aging or replaced tubes.**

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- Chrome plated chassis
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- Octal socket for preamplifier power connection (wired for Heathkit, Dyna-kit and other preamplifiers)
- Fuse receptacle on chassis
- Heavy duty power cord
- Biased filament supply
- Tubes: 2-6550, GZ34, 6BA8A
- Completely assembled, wired, and tested
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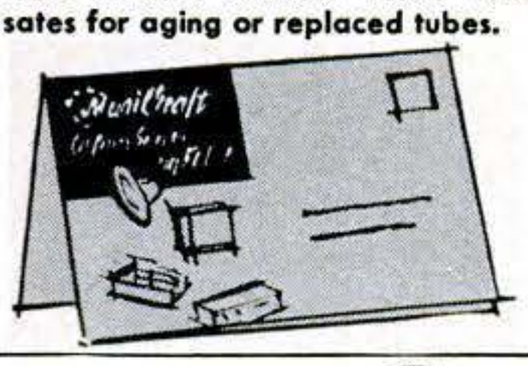

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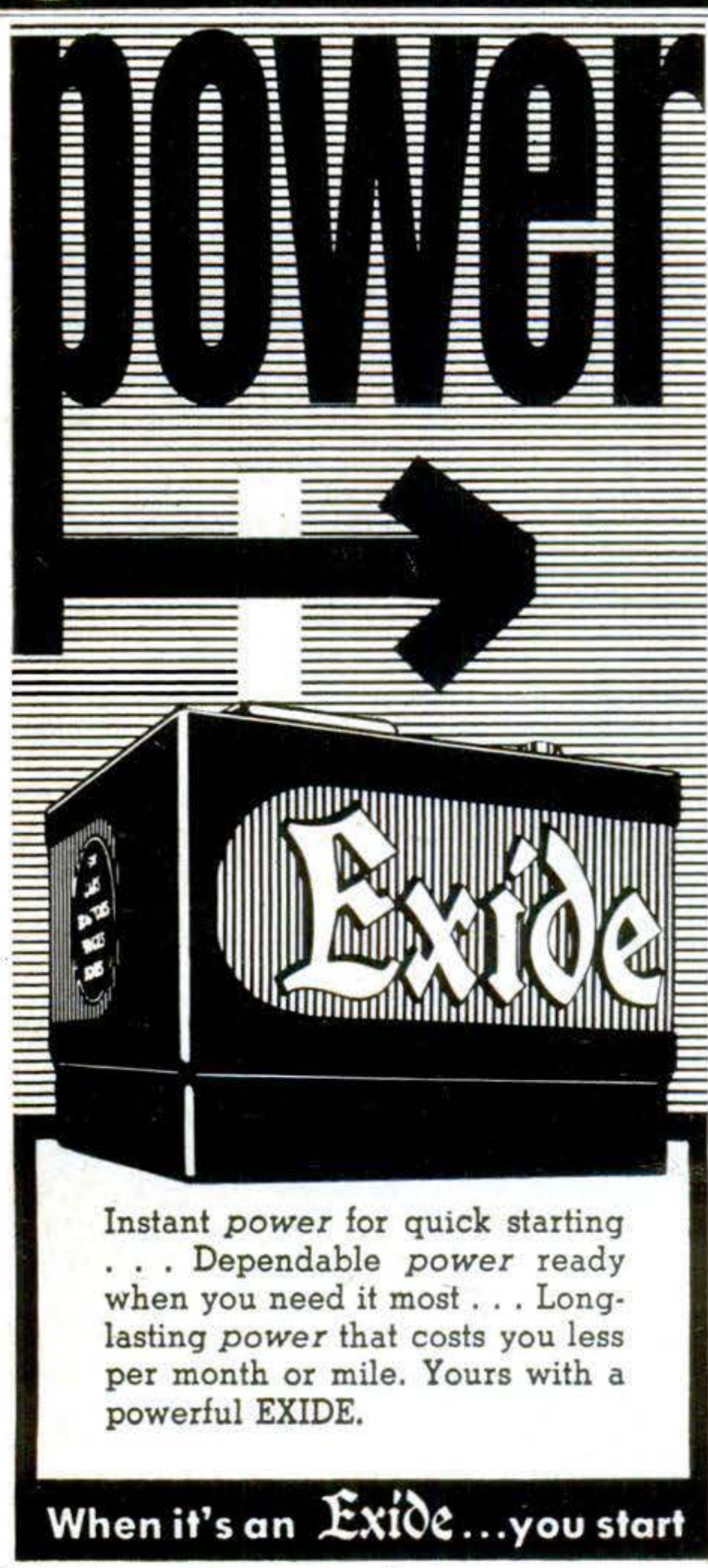

Chevrolet—Lower, Longer, Livelier

[Continued from page 110]

fore it was ready. Strictly a high-speed, competition Corvette sports-car power plant, it idled badly. It cut out at stop lights. It used too much gas. It proved to be as hard to get for a conventional passenger car as gold from Fort Knox.

The 1958 fuel-injection system is well-mannered, responsive and—mark this for future reference—increasingly easy on fuel. On cross-country safaris, it uses less than carburetors. Presently, it will use less on stop-and-go.

The racing camshaft of the original 283-cu-in. engine to which the fuel-injection system was fitted has been replaced with a "street" cam for ordinary driving. The fuel nozzles, fuel distribution and cold-start priming have been changed. The fuel cut-off on "over-run," when the car drives the engine, is eliminated—it succeeded only in draining the fuel system and killing the engine.

The result is an engine that reacts to the accelerator toe like a cat to a pinched tail. You search in vain for one of those familiar "flat spots" at hard throttle so common to carburetor engines.

Mated with Chevrolet's Turboglide automatic transmission, a three-turbine torque converter that has no gear "steps" in accelerating or decelerating, fuel injection supplies the smoothest-power source presently available in any U. S. car.

It's still costly, but have patience. When field servicing experience is adequate, the sales broadsides will thunder and prices will drop.

That new 348-cu.-in. engine sends the horsepower soaring again. (And who doesn't remember when the Cadillac's 331 inches of only three years back was *some* engine!) At 280 horses, Chevy's new engine is an option. But don't take this thing, equipped with "three-by-two" carburetion —three two-barrel pots—at its face value.

The new engine was not designed for the division's passenger cars. It's for trucks. Like Ford, Dodge and Studebaker engines, Chevy's mills perform well in trucks, too. The Chevy management is pictured as a mite reluctant to make the mammoth new engine available for cars, but some of the customers will buy them, and the bigger the production, the cheaper the manufacturing cost.

If, however, anyone present believes

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• Use golf or boys electric car. Geared 140 to 1. Run 6 or 12 volt auto storage battery. Easily reversible. Full instr. Wt. 34 lbs. Govt. cost $250.....**$19.46** FOB

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• Hang-up type standard type phone. Mount on side of desk, on wall, etc. Ringer box (not shown) also furnished. Use as extra-answering set, call out, etc. Nearly new. Perfect. Govt. cost $19.50. SALE **$8.32** Ppd.

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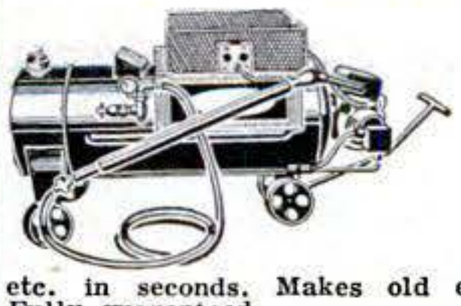

• Amazing new top brand fully automatic oil burning 115-v AC steam cleaner. Generates high pressure steam in 90 sec. Using soapy fluid will clean dirty, greasy engines, motors, tools, etc. in seconds. Makes old engines look new. Fully guaranteed.

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LINESMAN'S CLIMBERS AND BELTS

• Genuine Govt. surplus new top brand standard pole climbers and safety belts. All leather straps, pads, safety belt, etc. Designed to fit average man. Learn to climb—wonderful opportunities at excellent wages, power, phone companies. Save 50%. Prepaid.

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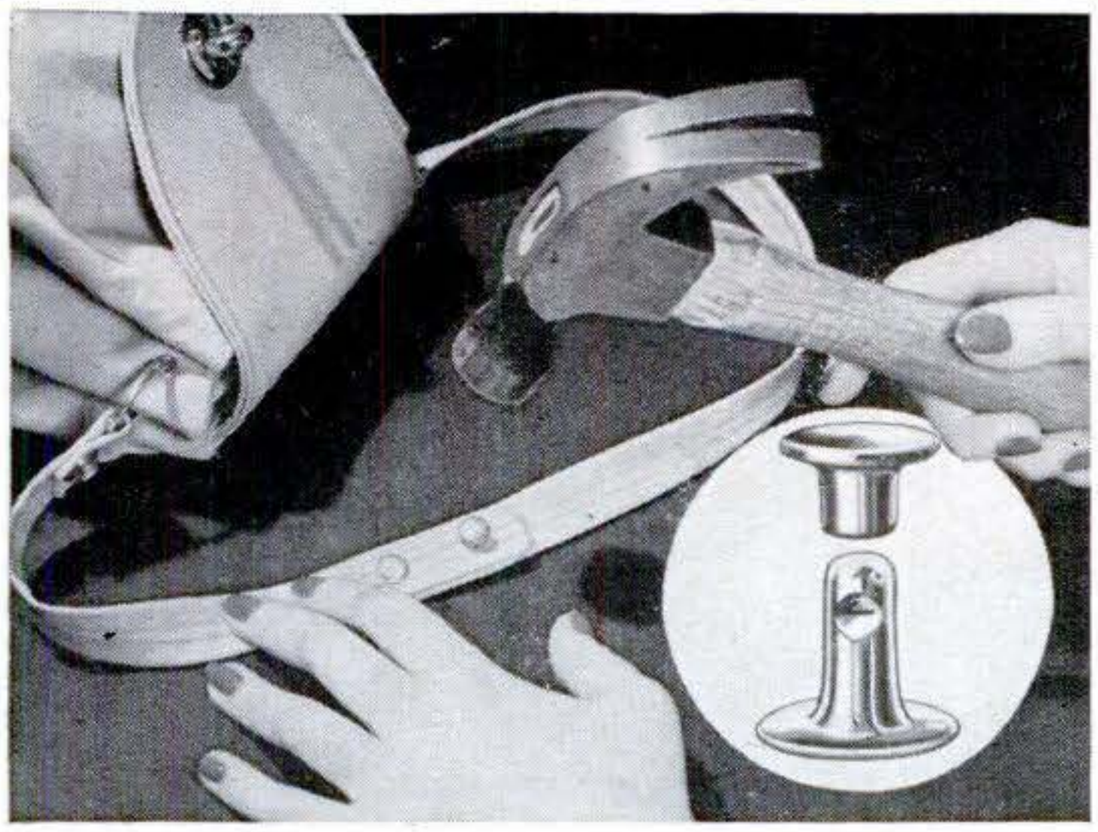

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But now—using Water Impact and Air Pressure, here is a new unit called the **Plumber's Flushing Gun,** which cleans all lines up to 100 ft. It will open any number of bends in pipe. Yet anyone can operate this new gun, which triggers easily.

TOILETS, URINALS, SINKS, and FLOOR DRAINS clogged with paper, grease, rags, sand, and other debris can be cleared with one or more shots from the gun, **saving the owner, the Gun's price the first time it is used.** This new Flushing Gun may be used on any ½ to 6 inch waste pipe including Sink Drains, Floor Drains, Hot Water Pipes, Drinking Fountains, Septic Tanks, and Urinals. Obstructions melt away INSTANTLY when struck by the hammer like blow of this new unit.

AMAZINGLY EFFECTIVE a hose attachment from the faucet (not shown here) leads water thru the Gun and pipe while at the same time air is released causing a Powerful Chain reaction.

This New Flushing Gun is offered on 30 Days Free Trial. BUT MOST IMPORTANT IS THIS—What is this Tool worth in **Costly Plumbing Bills** Saved in your Home or building? For your own good—Tear this Ad out now and write your name and address beside Ad for **FREE BOOKLET.** No agent will call—Obey that urge, mail now or write postcard. (Chicago Phone Kildare 5-1702) **MILLER SEWER TOOLS, DEPT. PS-11, 4642 N. CENTRAL AVE., CHICAGO 30, ILLINOIS.**

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that this engine is not being offered for passenger cars as a match for Plymouth's new 350-inch engine and the imminence of a Ford juggernaut, he may don the dunce cap in the corner.

Acceleration figures for the '58 Chevy with the big engine and Turboglide are: 0-60, 10.5 seconds; 50-65, 4.5 seconds.

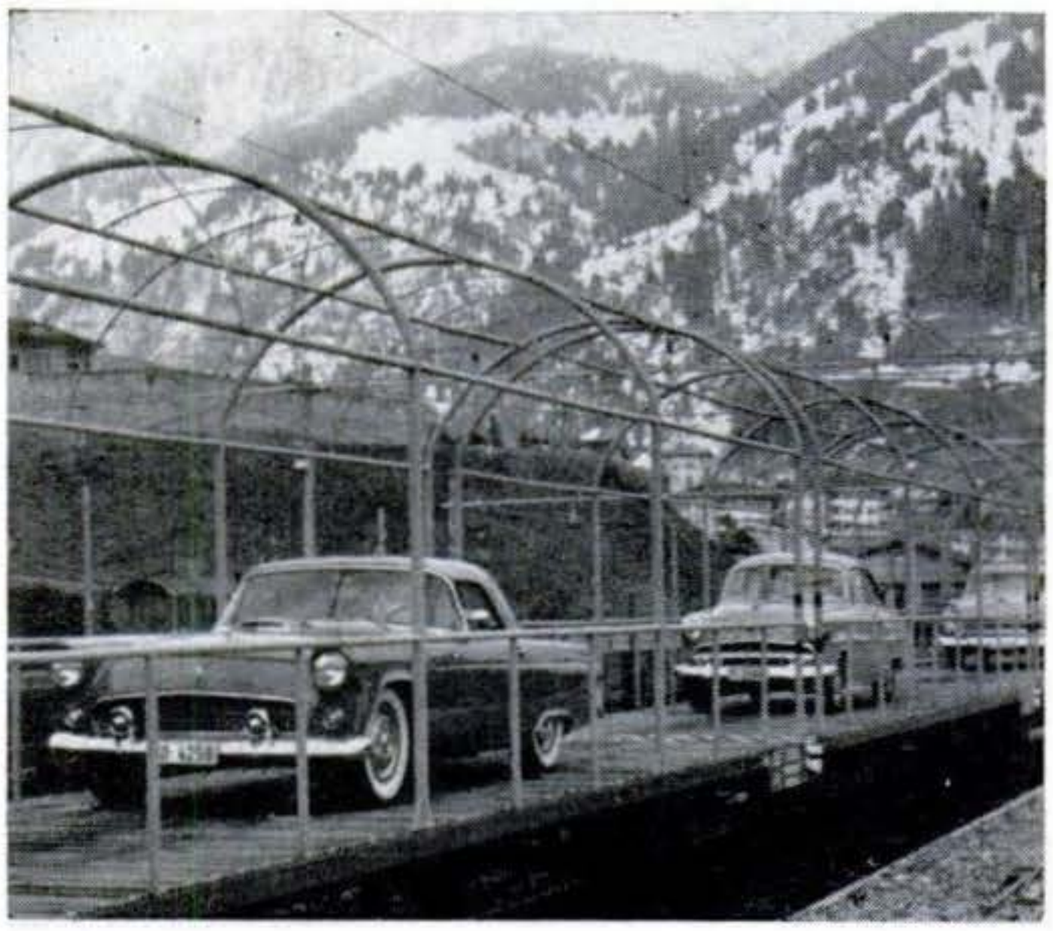
Chevy still dotes, with justification, on its 283-inch engine, at up to 250 hp., for 1958. That's basic to the conviction of Ed Cole, the general manager, that a medium-size, short-stroke V-8—by definition a high-speed engine—can produce everything the average motorist needs. He parts company with those who argue for ever-bigger engines. Why, he asks, take the fuel-consumption penalty of a bigger engine, and then try to make up for it by cutting r.p.m.'s and lowering rear-axle ratios?

Moreover, all that weight annoys him. His engines weigh 75 to 80 pounds less than comparable ones of his competition. His cars are lighter, too.

"With today's suspensions," says he, "you don't need weight for a soft ride."

He should know, having worked in suspension for both Chevrolet *and* Cadillac in the past. Come to think of it, that may account for Chevy's Baby Cadillac. END

Cars Ride Piggyback in Alps



WHEN snow and ice close Swiss mountain passes, autos are detoured through Alpine tunnels on electric-railroad flatcars designed for safety. A frame of arched tubing intercepts and grounds current if the overhead power line breaks. Side rails keep car doors from opening while the train is moving.

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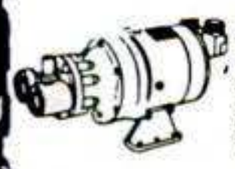

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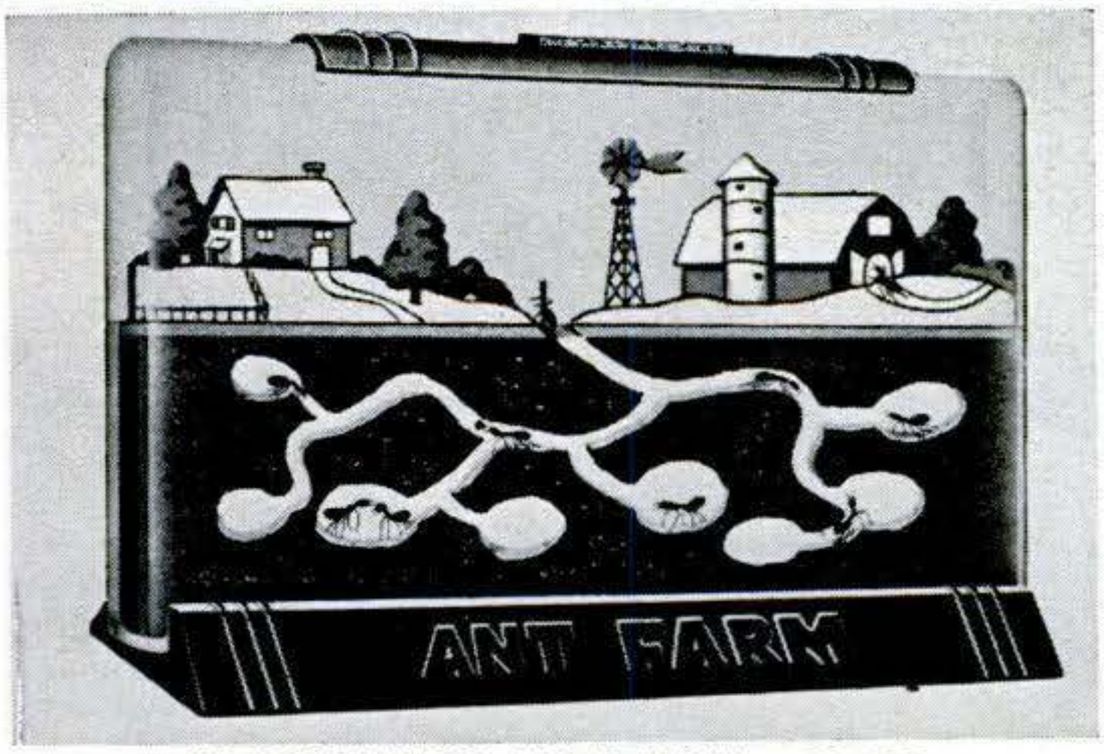

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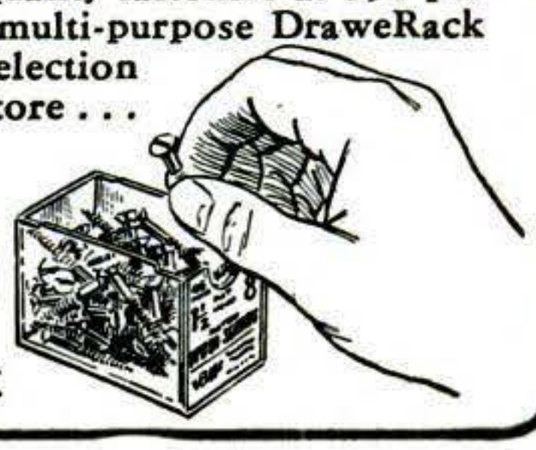

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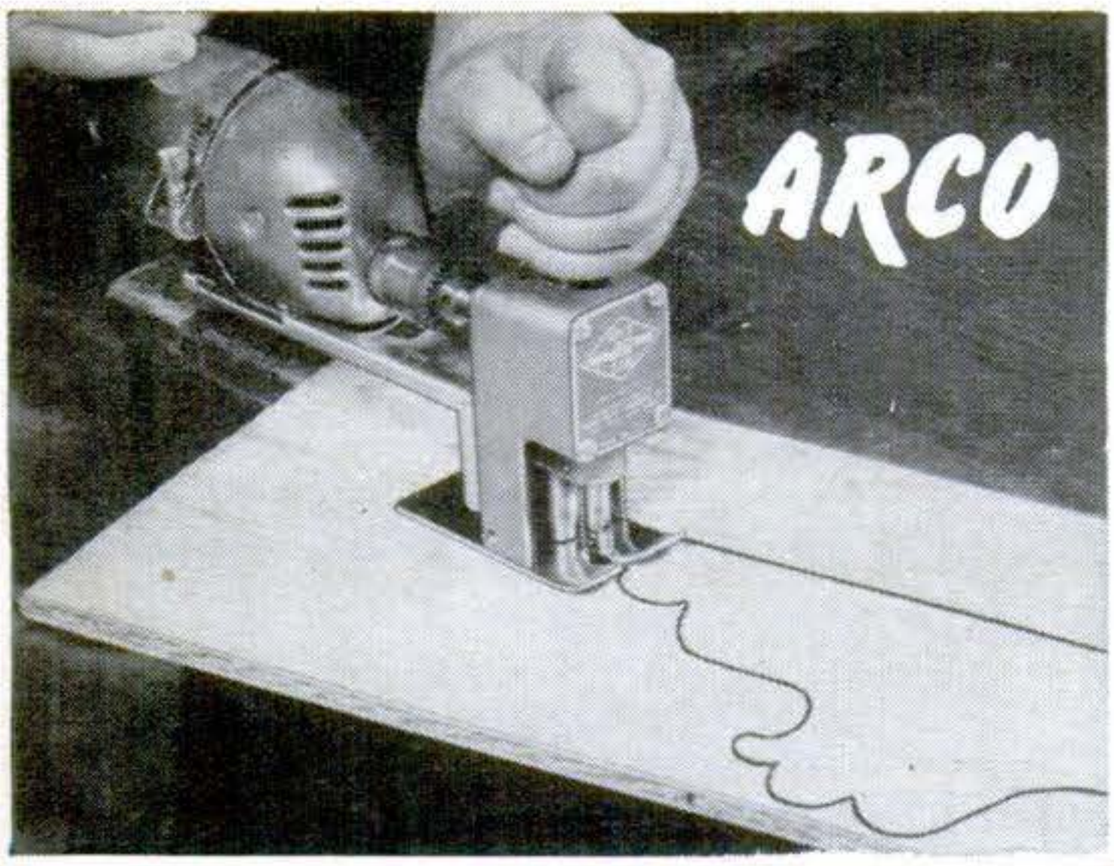

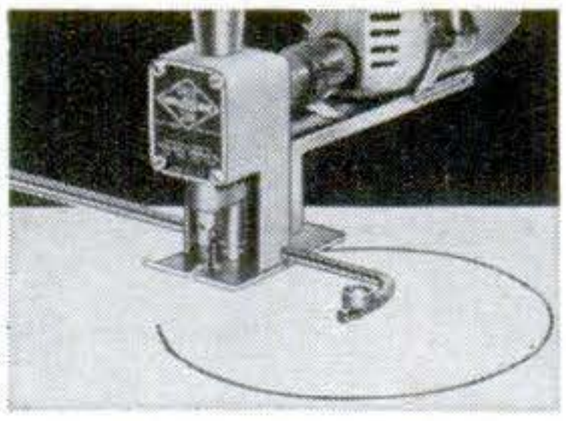

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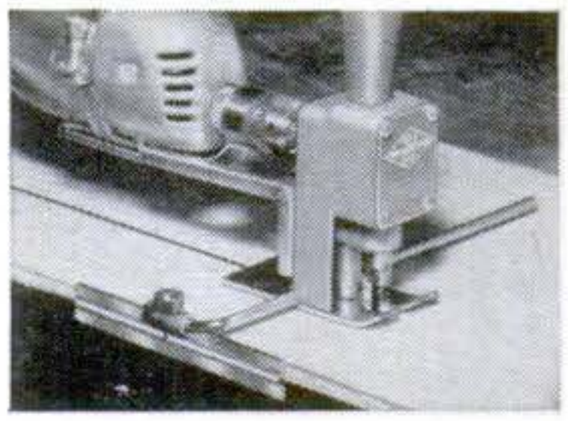

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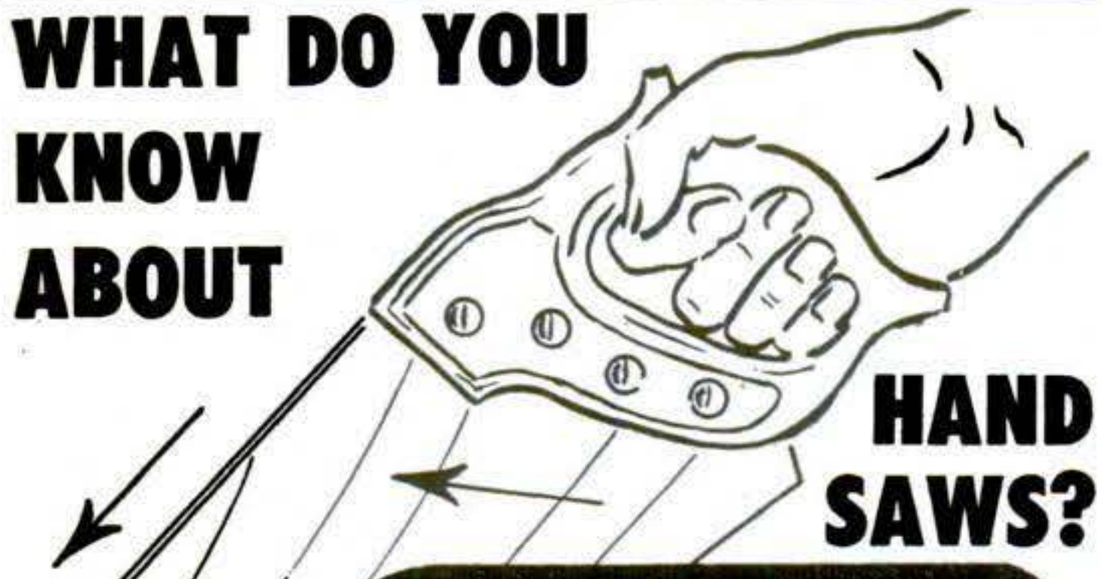

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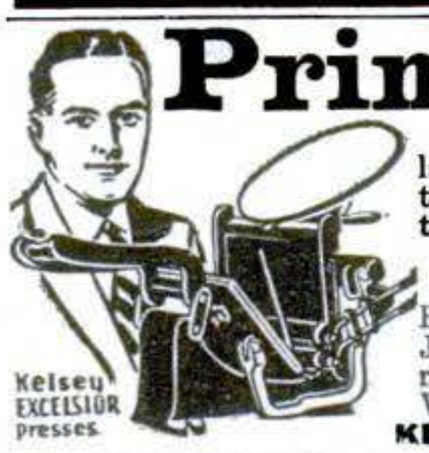

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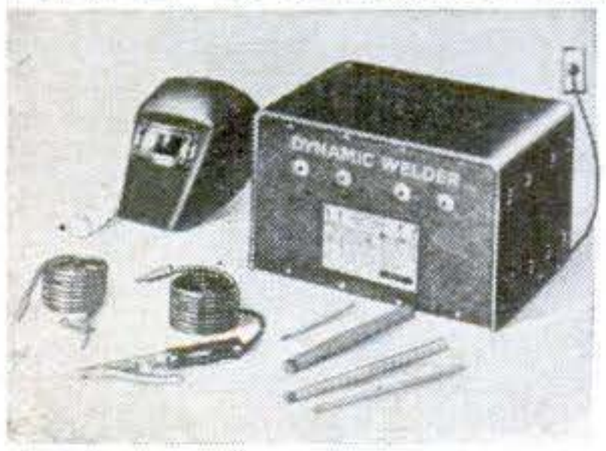

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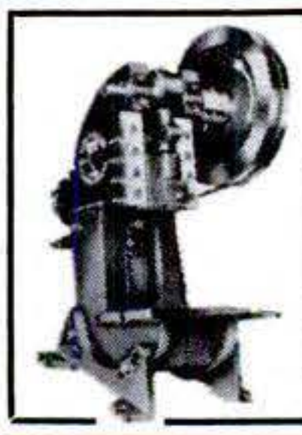

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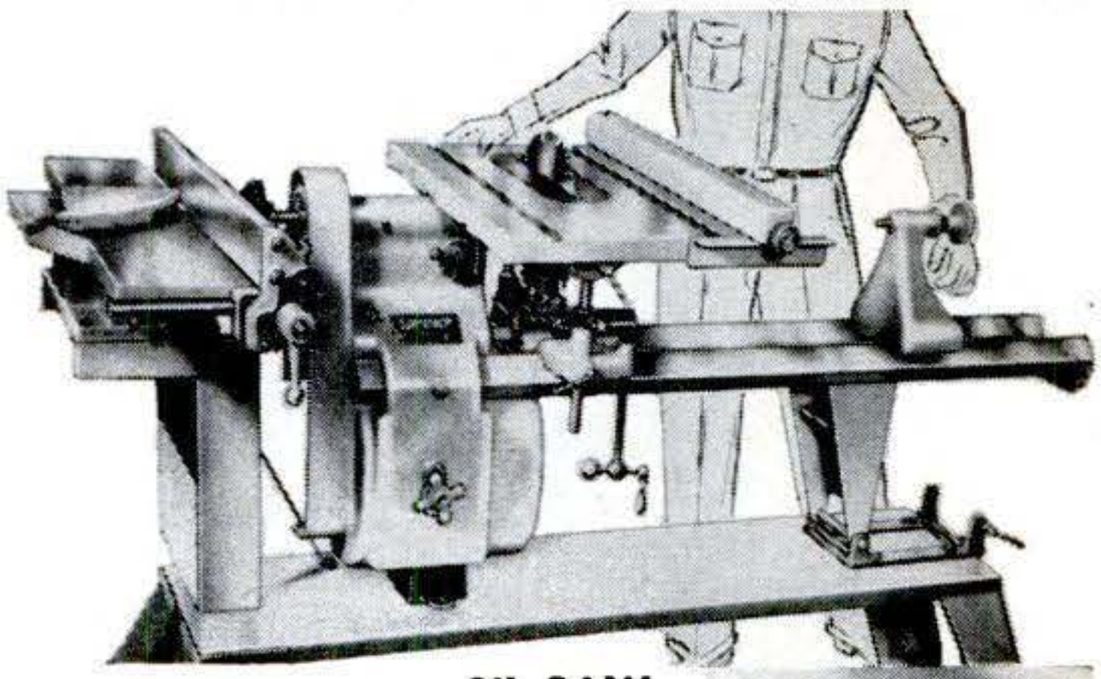

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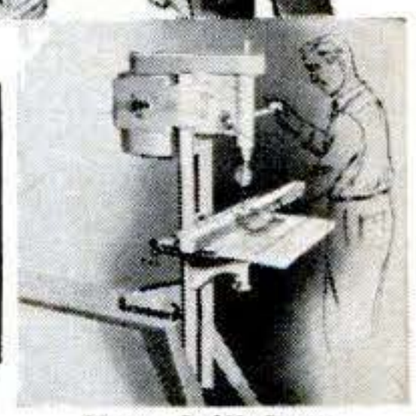

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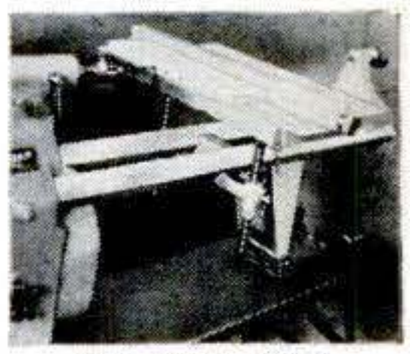

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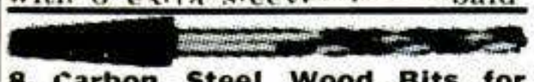

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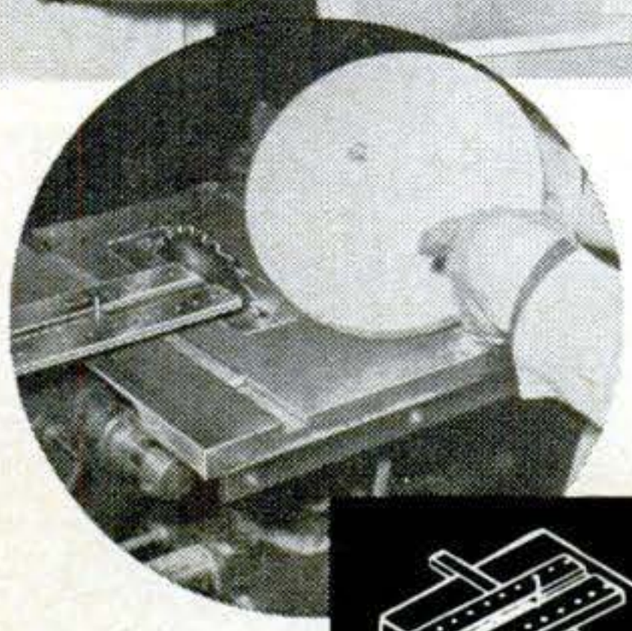

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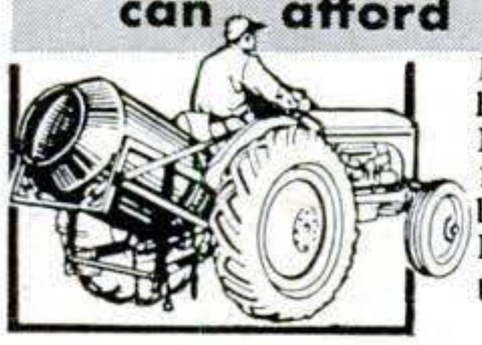

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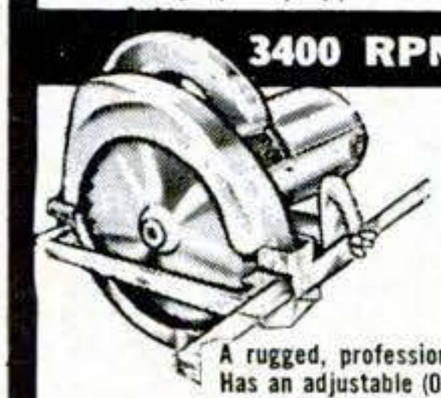
7—Guaranteed to perform perfectly on ANY RIFLE.

8—Made by leading American Optical firm.

MOUNT INCLUDED with SCOPE

SIDE or TOP MOUNTS available with scope to fit most rifles. When ordering specify type mount, gun model number and brand.

3400 RPM-½ HP POWER SAW



RIPS - CROSSCUTS

CUTS A FINISHED 2x4 LIKE A KNIFE THROUGH BUTTER

COMPARES TO SAWS SELLING UP TO $49.50 **19.98** Complete with 5-1/2" Blade

A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable (0 to 6") rip fence. Safety-trigger switch on handle. Full ½ HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6½ lbs.

EXTRA SAW BLADES – Available in Rip, Crosscut or Combination. Please Specify ONLY 2.25 EA

AMAZING 396 Pc. BARGAIN CATALOG

NATIONALLY ADVERTISED MERCHANDISE • NEW and USED GOV'T. SURPLUS • FACTORY CLOSEOUTS • EXCITING IMPORTS!

From EVERYWHERE PALLEY'S brings you items of every description. Camp & Sports Equip., Marine Supplies, Cameras, Optical Specialties, Hand & Power Tools, Building Supplies, Do-It-Yourself Supplies, PLUS so many more it's impossible to list them.

Send 50¢ (for handling & mailing) 50c REFUND on your first order of $1.00 or more.

ORDER-BY-MAIL

TERMS: Send Check, Cash or Money Order. 50% Deposit with C.O.D.s. Prices F.O.B. Los Angeles, Calif. Warehouse.

Palley's 2263 EAST VERNON AVE., DEPT. PS-11 • LOS ANGELES 58, CALIF.

AMAZING NEW SCIENTIFIC DESIGN

60 to 600 POWER – 2 EYEPIECE

SPECIAL MICROSCOPE

HAS 60 - 150 - 200 - 300 - 400 & 600 POWER MAGNIFICATION WITH ILLUMINATED SUB-STAGE MIRROR and TRIPLE TURRET

Now you can change magnification with a simple shift of the dual eyepiece turret. No loss of focus – No readjustment. You choose either 10X or 15X eyepiece to use in an instant with any of the three objective lenses.

NOTE THESE FEATURES

All lenses are precision ground and polished. Has triple revolving turret with 8X, 20X and 40X lenses – Dual eyepiece has 10X and 15X lenses – NEW patented sub-stage with battery operated light . . . no external light source is necessary – Large sub-stage has a revolving, variable iris – Body is ALL-METAL and is designed to incline through 90°. Comes complete with fitted wood case and 3 glass slides. . . . . **14.95** XMAS SALE

SPECIAL 60 to 450 Power MICROSCOPE

HAS 60, 120, 150, 180, 300 and 450 POWER MAGNIFICATION

With NEWLY DEVELOPED SUB-STAGE LIGHT which ELIMINATES NEED for ANY EXTERNAL LIGHT SOURCE.

Another Palley Optical Bargain. Ideal for scientific inclined Boys & Girls, Adults, Home labs, etc. Has precision ground pad polished lenses. Two interchangeable eyepieces of 6X and 15X – Triple revolving turret with 10X, 20X and 30X lenses – Patented sub-stage mirror with self-contained light for use without external light source plus large sub-stage mirror for use with external light source when desired – All metal body which inclines through 90° – Fitted wood case and 3 glass slides. Order WHILE STOCKS are COMPLETE!

FREE with MICROSCOPE 8-PIECE DISSECT SET. Has Scalpel, Scissors, 6 Slides, Tweezers, Magnifying Glass, etc. . . . . **NOW 10.95**

100 - 200 - 300X MICROSCOPE

A triple revolving, objective lens turret allows selection of 100, 200 or 300 POWER magnification. Has fine, ground and polished lenses and ALL METAL construction. This instrument is NOT A TOY! Right or left hand rack & pinions make smooth, precise adjustments. **NOW 6.95**

25 POWER x 30 MM TELESCOPE & TRIPOD

$25.00 VALUE

Specify WHITE, BLACK OR CRACKLE FINISH

Nowhere but at PALLEY'S can you find a buy like this! Here's a scope, complete with a sturdy metal tripod, that you can have a lot of fun with. Use it to spot hits on the target, for star-gazing, interesting views at the beach, etc. Made of aluminum and chrome plated brass. Field: 62 ft. at 1000 yds. **ONLY 5.95**

PIGSKIN CASE for above $2.00 extra

20 POWER x 40mm SPOTTING SCOPE WITH TRIPOD & CASE

NEW 29.95 VALUE

IDEAL FOR HUNTER-TARGET-ETC.

Imported directly by Palley's. The finest spotting scope for the money that we have seen. A FULL 20 POWER MAGNIFICATION yet small enough to fit easily in your gun case, knapsack, etc. Has precision ground and polished lenses and prisms throughout. With fully coated objective lens. Eye-piece is fully adjustable. Comes with a sturdy tripod and special leatherette carrying case with zipper enclosure. Weighs only 15 ozs. Overall length 8⅜".

SPECIAL AT **17.98**

NEW IMPORT 5X ILLUMINATED MAGNIFIER

Gives brilliant illumination for precise inspection of any material, substance or specimen. The head contains a large 50mm lens and has an internally calibrated scale to show relative size of subject. All-metal body holds 2 flashlight batteries. A 7.95 value. . . **Only 3.49**

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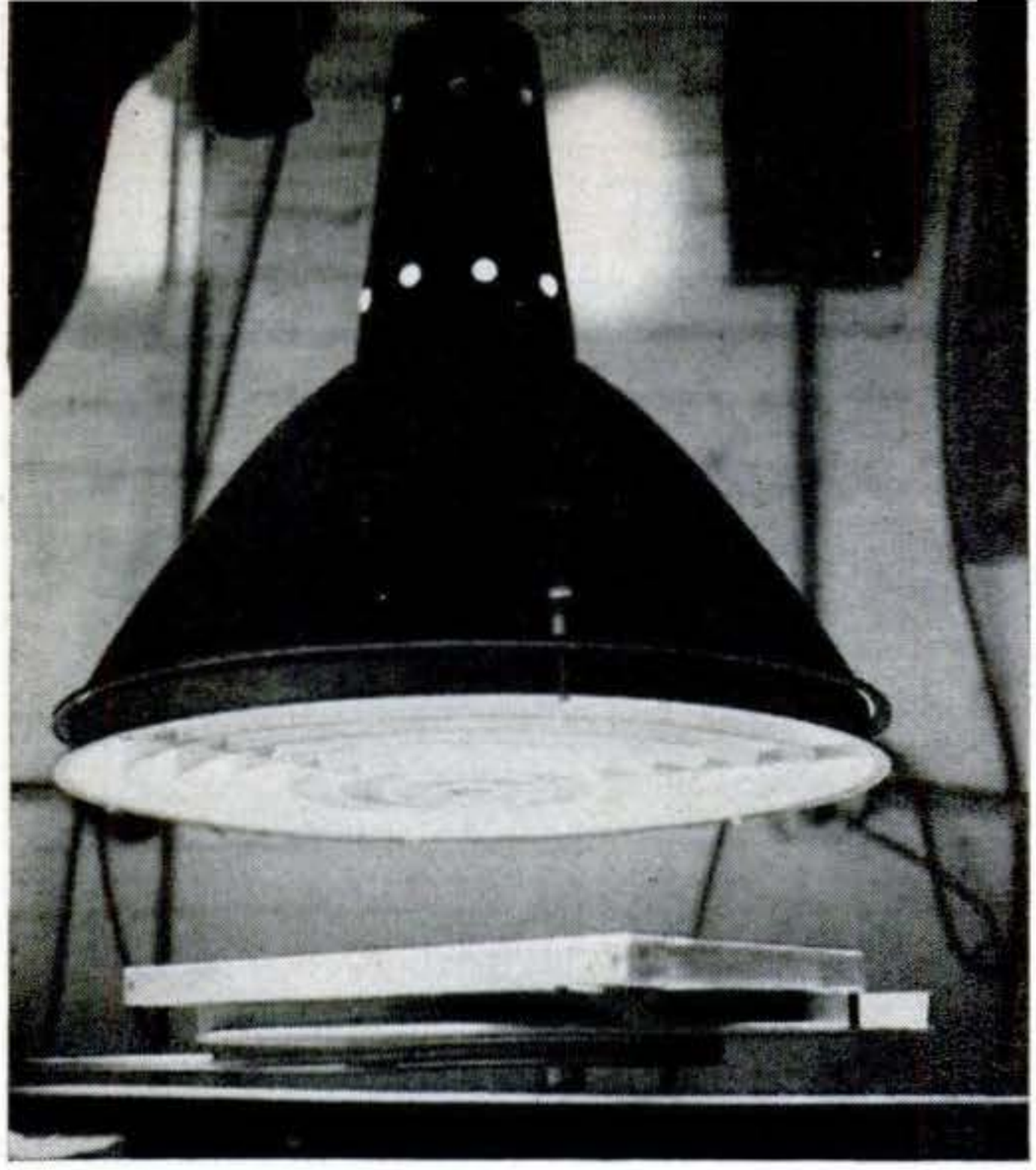
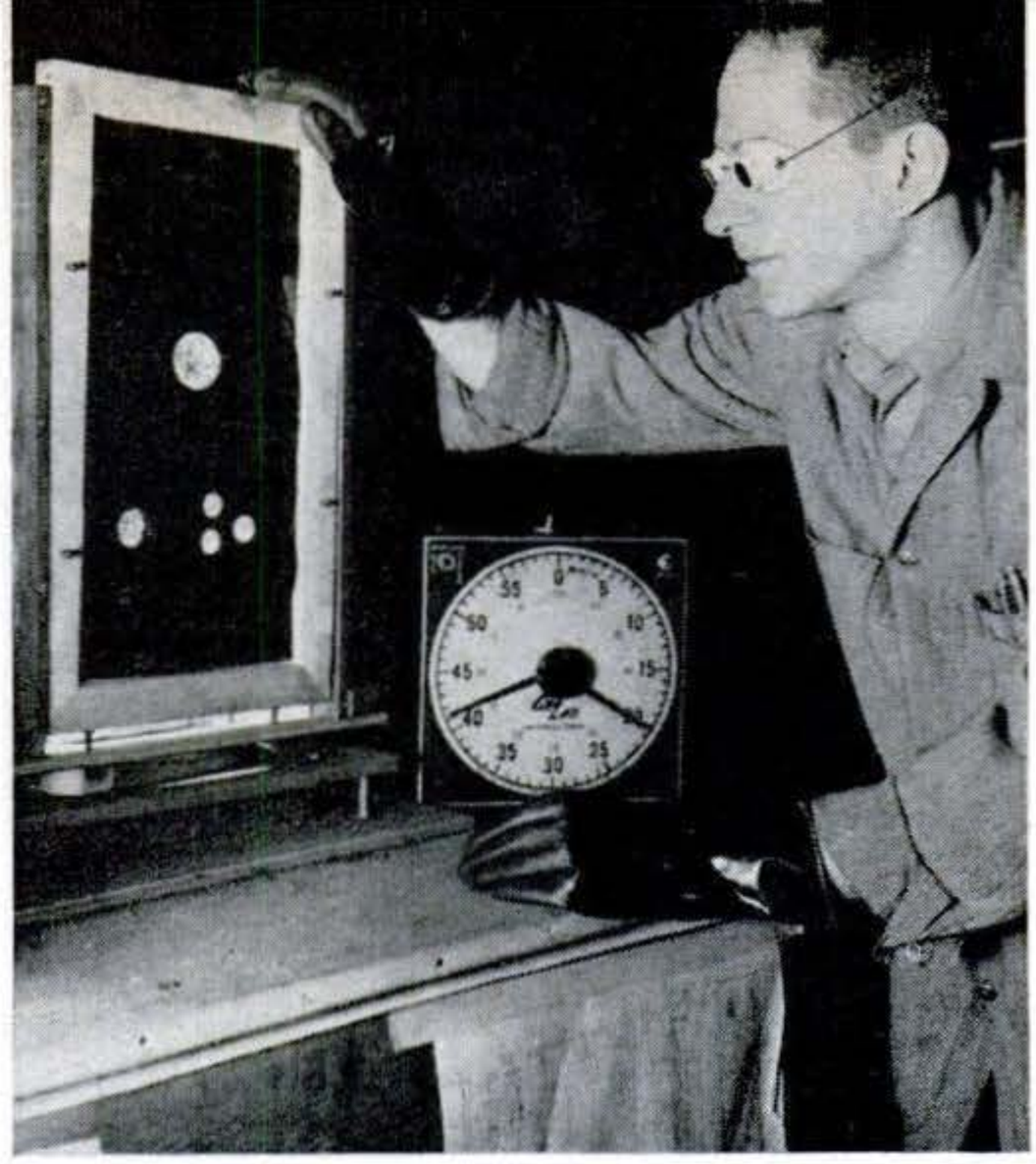
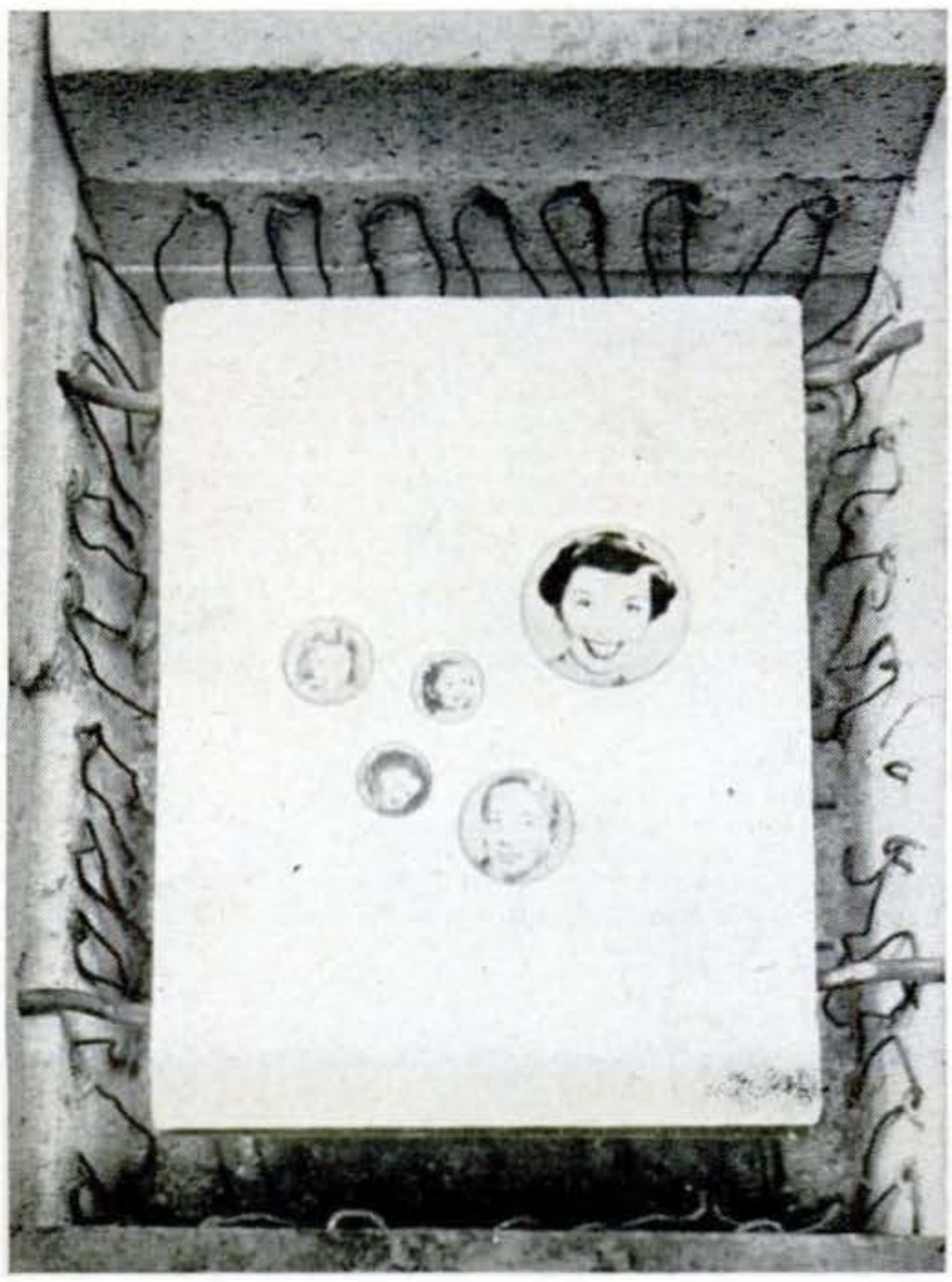


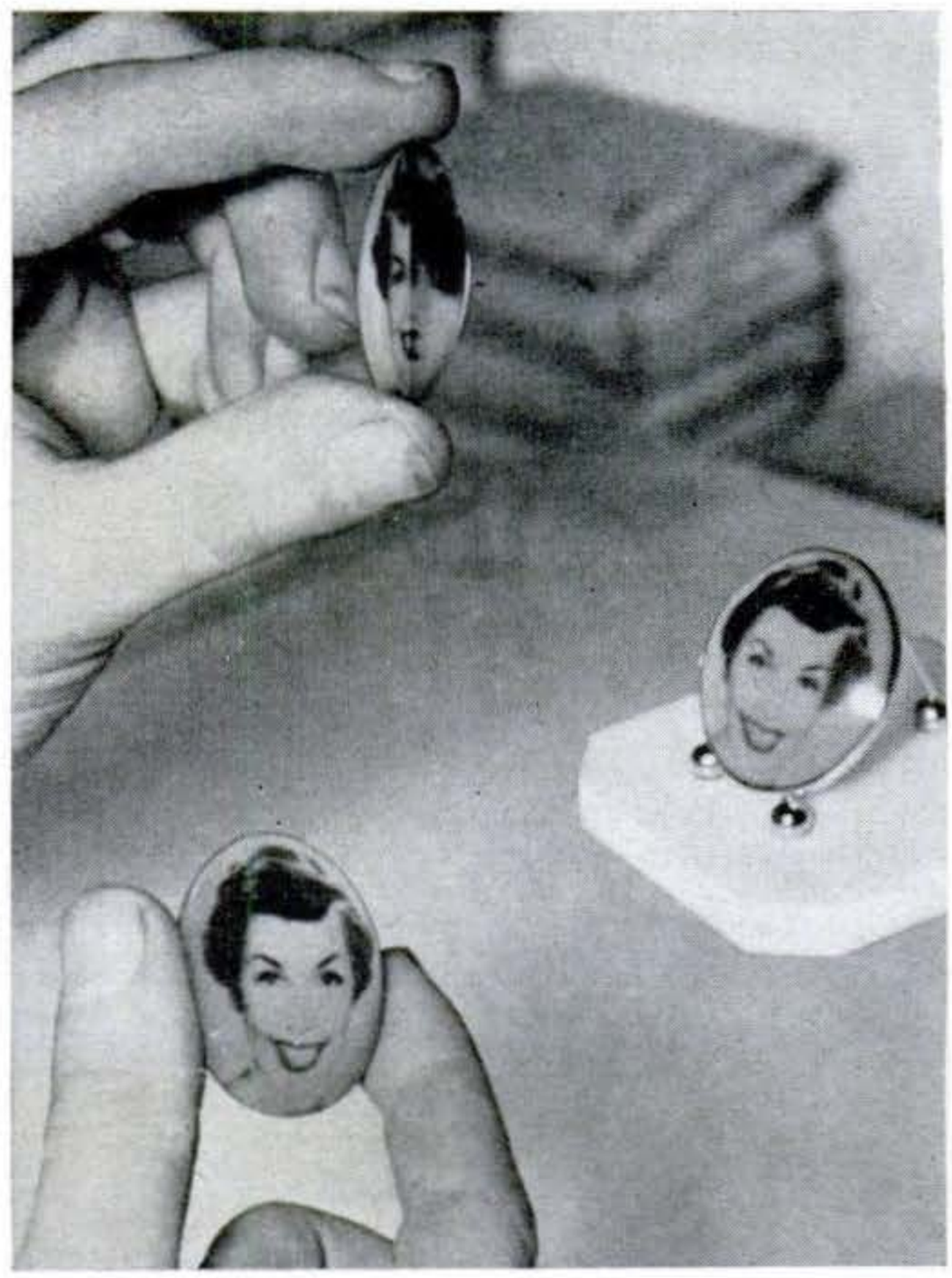
ULTRAVIOLET LIGHT transfers picture image from special negative to photosensitive crystal.



AFTER SEVERAL HOURS, frame holding crystals is taken from light by developer Norman Mernoff.



HEAT AT 1,200 DEGREES in electric furnace brings out the positive image in the crystal.



QUARTERED CRYSTAL (in upper hand) shows undistorted image appearing all through material.

Photos Printed in Crystal

Now you can have a portrait printed in, not just on, crystal. Using a photosensitive crystal made by Corning Glass Works, Norman Mernoff has developed a method that embeds the image in the substance. At his plant, Dornel, Inc., New York, he exposes crystal and negative to ultraviolet light up to 85 hours depending on size, then bakes the crystal in an electric oven to bring out the image. One print, in a Marchal Jewelers setting, won a top national diamond-show award.

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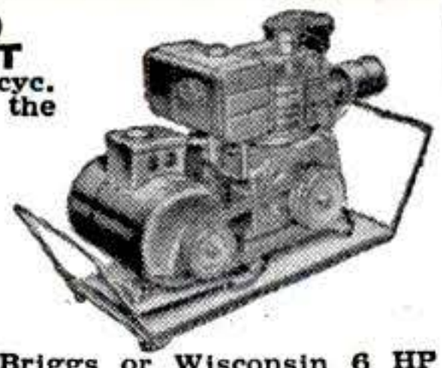
PORTABLE LIGHT PLANTS

GIANT 2500 WATT PLANT



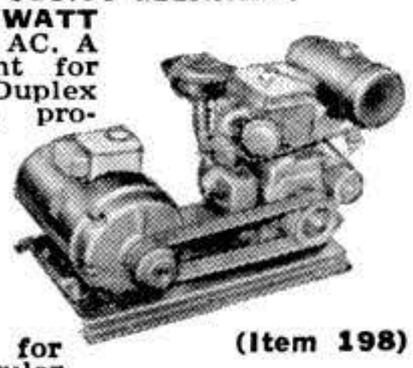
110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price $585. Special at..... **$299.50**

Same plant with electric self starter (Item 31a)..... **$359.50**

Generator only and control box....**$169.50**

DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

POWER-FLO 3500 WATT



(Item 198)

115-230 v. 60 cyc. AC. A rugged power plant for heavy duty use. Duplex power distribution provides both 115 v. and 230 v. output at the same time if desired. Powered by a big 8 HP Wisconsin engine with triple V belt drive. Has built-in overload protection. A dependable plant for either standby or regular service. Equipped with electric self-starter. (Can also be started by rope) and plug-in outlet box. (Item 198) Wt. 310 lbs. Factory price..... **$439.50**

GENERATOR ONLY belt driven.....$239.50

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM.)

8" Pipe, wt. 5 lb.....$6.85
9" Pipe, wt. 6 lb.....$7.85
10" Pipe, wt. 7 lb.....$8.85
12" Pipe, wt. 8 lb.....$9.85

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E).....$11.95
12" Fan. wt. 10 lbs. (Item 10D)....$12.95

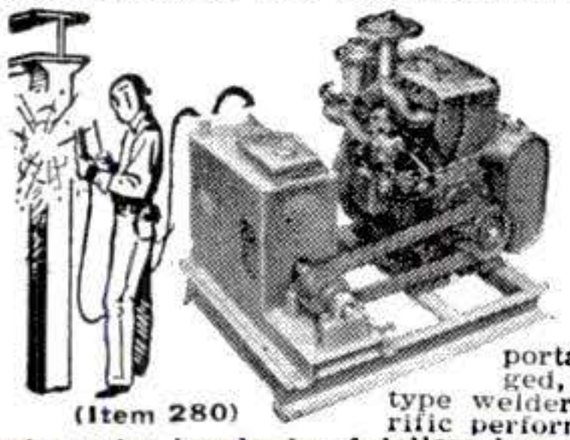
HIGH SPEED BARN FAN similar to above, but larger, high speed motor moves huge volume of air.
12" Fan (item 10f).....$14.95
14" Fan (item 10g).....$17.95

GIANT METAL SHEARS

"PEXTO"

Nine inch cutting blade made of special high carbon alloy steel, perfectly aligned and ground. Easily cuts steel plate up to 12 gauge or 1/8" thick. Overall length 40". Wt. 23 lbs. (Item 156) Regular $49.50. While they last..... **$14.95**

MASTER DC ARC WELDERS



(Item 280)

Now! a portable rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and **triple** V-belt or flat pulley. Easy to hook up and easy to operate.

WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. $450 value..... **$119.50**

WELDER ONLY—INDUSTRIAL MODEL same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38b) $500.00 value..... **$139.50**

COMPLETE POWER MASTER (Illustrated above) powered by a 16 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Factory Special..... **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at...**$10.50**

SAVE middleman profits BUY DIRECT from MASTER MECHANIC factory

(Item 24)

700 WATT PLANT

PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2.2 HP. easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Regular $275.00 value..... **$143.50**

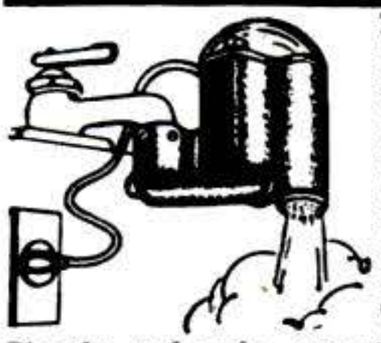
1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output..... **$199.50**

We make every type and size of light plants —Write, giving us your requirements!

BATTERY CHARGING GENERATOR
Push Button Start

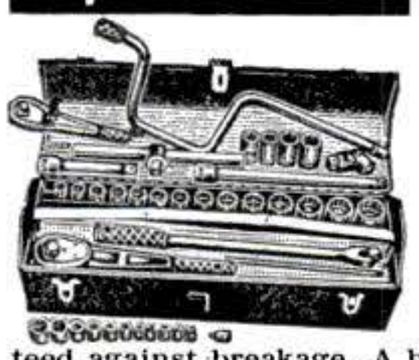
A husky, 750 watt plant (designed for battery charging only) that will charge 6 or 12 volt batteries in just minutes! When mounted with two 6 volt batteries it provides a terrific cold weather motor starting unit, as well as a fast charger! Charges all batteries anywhere — no hi-line current needed. Ideal for service stations, garages and farms. Comes complete with ammeter and cutout. (Item 821) Wt. 120 lbs. Regularly $295. Our special, only.. **$119.50**

FAUCET WATER HEATER



Instant hot water from any faucet for just pennies—sounds unbelievable—but it's true! You just slip MASTER MECHANIC'S new Faucet Water Heater over any water faucet, plug it in a wall outlet and you've got steaming hot running water instantly for dishes, shaving, washing baby's bottle, etc. Simple and safe—operates on ordinary 110v. house current—costs only 2½ cents per hour for hot water. Ideal for homes, barns, cabins, trailers, etc. Easily regulated from lukewarm to full hot. Fully guaranteed! (Item 408) Wt. 2 lbs. Factory price F.O.B. Burlington, only..... **$4.95**

52 pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in 1/2" drive, 3/8" drive and 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a big doghouse steel box. Wt. 17 lbs. (Item 205) List price $62.90. Factory special.. **$29.95**

CABLE HOIST

2000 lb. CAPACITY. A fortunate purchase from the Air Force enables us to offer these **brand new** 2000 lb. electric cable hoists at a fraction of their value. Perfect for material handling, boat hoists, elevators, lifts on assembly lines, etc. Two separate 22 ft. lift cables with independent controls permit leveling the load and controlling it perfectly. Rugged ball bearing motors of geared down design 110 volts. Available for A.C. or D.C. Please specify. Makes a terrific portable hoist with our ±273 D.C. light plant at $99.75. Offered at less than 33% of regular cost (Cable not included). Wt. 145 lbs.
A.C. Model, item 847A.....$149.50
D.C. Model, item 847.....$129.50

LESS THAN WHOLESALE

1500 WATT PLANT

115v. 60 cyc. AC Push Button Start. Powered by a 3½ HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22). Wt. 110 lbs. Reg. $475 value, Factory price... **$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric **starting & battery** charging built-in! Factory price... **$279.50**

MASTER-LITE 2500 Watt Plant

(Item 21)

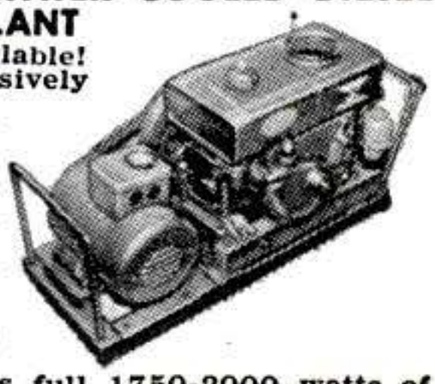
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by **rope or** built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in **power receptacle. An ideal** plant for permanent **or stand-by service.** Wt. 225 lb. Reg. price $645.00 (Item 21) Factory Price **$329.50**

3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. $760. Factory Price.....$379.50

DUAL VOLTAGE 110/220 for Item 21 or 23 —$30 additional.

EXCLUSIVE! NEW!

LIGHTWEIGHT WATER COOLED DIESEL GENERATOR PLANT



Never before available! Now offered exclusively by Master Mechanic. A low priced, lightweight, **continuous duty,** Diesel generator set. Powered by a super rugged, exceptionally smooth running, one cylinder Diesel engine. Operates at conservative 1750 r.p.m. and delivers full 1750-2000 watts of power. Operates on low cost fuel oil. Wt. only 240 lbs. representing a triumph of Diesel Engineering. Complete with fuel filter, oil pressure gauge, control box with duplex receptacle and voltmeter. (Item 830) Special factory price..... **$399.50**

DIESEL ENGINE only, as above described 3.5 HP (Item 830a) Wt. 116 lbs..... **$249.50**

Double Acting Hydraulic Cylinder

A powerful cylinder mfr'd. by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder is 3⅜" O.D. with 6½" stroke—standard heavy duty clevises on both ends. Has standard ½" pipe thread openings. Can be used for tilting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. $68 value, Special..... **$14.95**

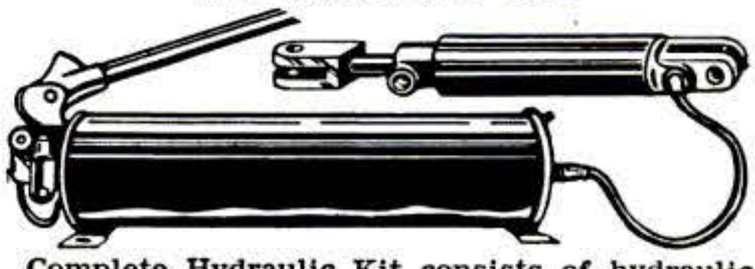
OTHER DOUBLE ACTING CYLINDERS

8" stroke — 3" bore.....$34.00
10" stroke — 3" bore..... 34.80
16" stroke — 3" bore..... 43.00
24" stroke — 3" bore..... 47.50

We have all sizes of cylinders available.

HYDRAULIC CONTROL VALVE — 4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. ¾" pipe thread on inlet & outlet,— ½" on cylinder outlets. Easily mounted, finger tip control. Wt. 16 lbs. (Item 822).....$21.95

HYDRAULIC KIT



Complete Hydraulic Kit consists of hydraulic hand pump with built-in 2 gal. reservoir and item 802 hydraulic cylinder described above. Pump has a built in relief valve and is rated at 20 tons. Kit is ideal for presses, jacks, snow-plows, etc. Pump is 29" long—6" diam. with 3/8" ports. A terrific value! (Item 836). Wt. 50 lbs..... **$39.50**

Pump only (Item 836a) only.....$23.50

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for ...BIG NEW Catalog

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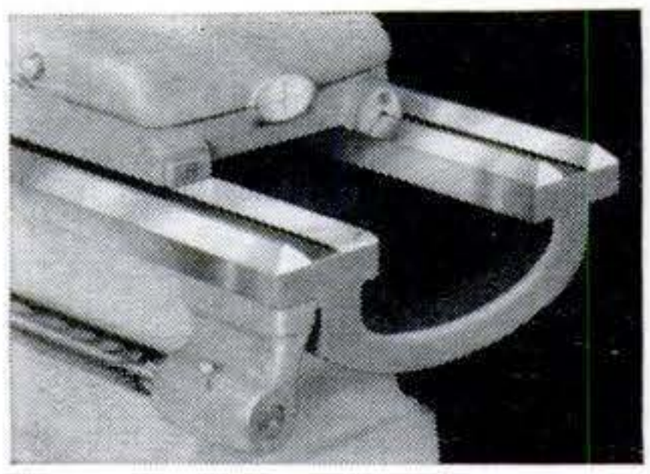
WHERE ACCURACY MEANS *Economy*

SOUTH BEND
14½" LATHES



HARDENED BED WAYS

Hardened and precision ground for longer life under severe operating conditions.

Specifications

Swing—14⅝" over bed and saddle wings.
Distances between centers—24½" to 60½" maximum.
Collet capacity—1" maximum.
Spindle bore—1⅜"
Spindle speeds—6, 8, 12 or 16 speeds, 15 to 875 r.p.m.
Longitudinal feeds—48
Cross feeds—48
Thread cutting range—48 pitches R.H. or L.H., 4 to 224 per inch.

SOUTH BEND ACCURACY GIVES YOU—

More output—no slow-up required to hold close tolerances. Fewer rejects—saves time and materials. Greater operating ease—less fatigue and effort. Top efficiency on every type of operation. Precision and smoothness that often eliminate subsequent grinding, honing or lapping operations. Prices of 14½" lathes start at $1975.

Send Catalog 5700 describing Engine, Toolroom and Turret Lathes; Milling Machines; Bench Shapers; Drill Presses; Pedestal Grinders and Attachments.

Name_____

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SOUTH BEND PAYMENT PLAN — SOUTH BEND

Up to 24 months to pay.

SOUTH BEND LATHE

Building Better Tools Since 1906
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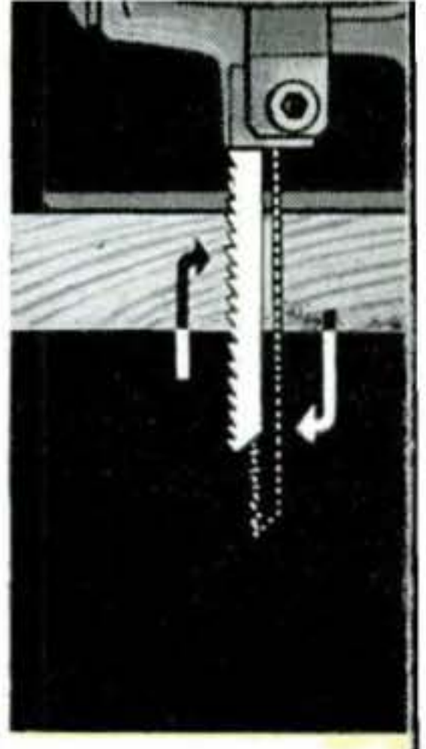
Introducing the most practical tool you'll ever own!

NEW PORTER-CABLE

ELECTRIC HAND SAW WITH



ORBITAL ACTION!

IT CUTS

LUMBER
PLYWOOD
STEEL
PLASTICS
MASONITE
PLEXIGLAS
ALUMINUM
IRON
ASPHALT TILE
BRASS
BRONZE
COPPER
LEATHER
LINOLEUM
RUBBER
LUCITE

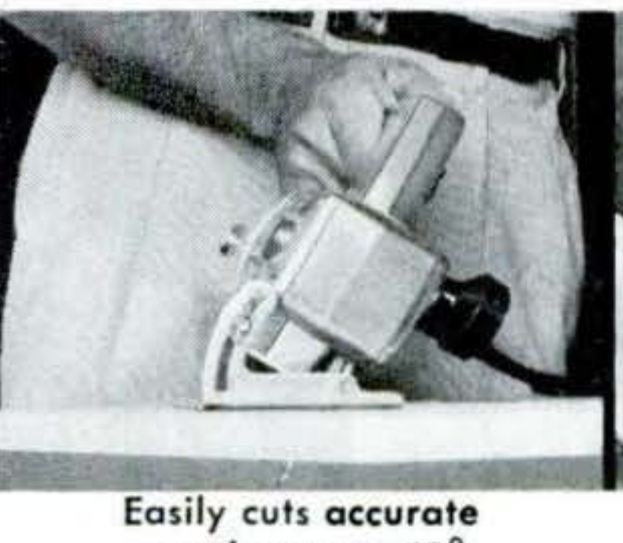
The saw that does everything 3 TIMES FASTER!

This versatile tool is actually seven saws in one . . . it's a rip saw, cross-cut saw, coping saw, keyhole saw, scroll saw, jig saw and hack saw! It makes inside cuts without drilling a starting hole—has a comfortable handle, and cuts 2" dressed lumber, 1/4" aluminum and 1/8" steel. For hundreds of jobs—from rough-cutting to intricate scroll work, Porter-Cable's hand saw has no equal! Model 152 . . . . . **$54.95**

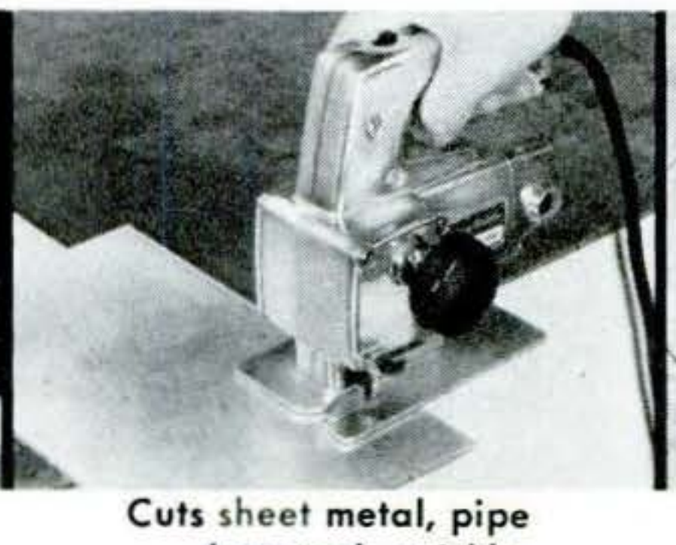
(Handy wall kit with accessories, $5 extra.)

World's only orbital action hand saw

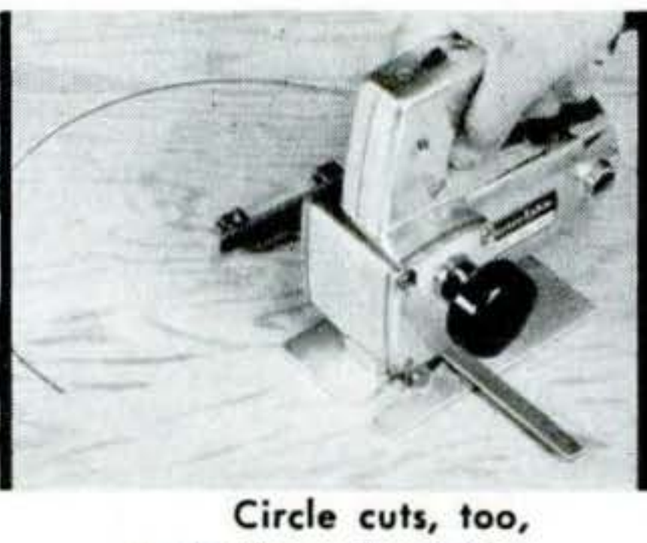
Most efficient cutting cycle! Blade moves ahead on cutting stroke – moves back and away on relief stroke. No dulling "drag" – blade runs cooler, lasts far longer, cuts faster.



Easily cuts accurate angles up to 45°.



Cuts sheet metal, pipe bar stock quickly.



Circle cuts, too, perfectly and quickly.

Handy kit mounts on wall or workbench.

The most practical drill kit ever offered!

Porter-Cable's top quality Screwdriver Drill Kit handles the *two most important* jobs of a 1/4" drill . . . drilling holes and setting and driving screws. Here's what you get:

1. **Finest Screwdriver Attachment Built.** It's a top quality precision tool — not an ordinary, cheap drill accessory! Converts drill to a powerful screw driver simply by inserting attachment into the chuck. Regular and Phillips head bits included with Yankee-type clip to speed change of bits.
2. **Patented, Versatile Screw Setter.** It drills pilot holes for threaded portion and shank of screws, countersinks for screw head and counterbores *all in one operation!* Adjustable for every standard No. 8 screw. Stops automatically at correct depth.
3. **Genuine Porter-Cable Quality 1/4" Drill.** Model 161 has these expensive drill features; precision ground gear chuck, rugged motor, heavy duty bearings and much more.

Complete kit with high speed twist drills and welded steel carrying case.
only **$37.50**

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